

Issued July 10, 1914.

U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE GEORGIA STATE COLLEGE OF AGRICULTURE;
ANDREW M. SOULE, PRESIDENT; DAVID D. LONG,
IN CHARGE SOIL SURVEY.

SOIL SURVEY OF GORDON COUNTY,
GEORGIA.

BY

J. O. VEATCH.

HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1918.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1914.

BUREAU OF SOILS.

MILTON WHITNEY, *Chief of Bureau.*

ALBERT G. RICE, *Chief Clerk.*

SOIL SURVEY.

CURTIS F. MARBUT, *in Charge.*

G. W. BAUMANN, *Executive Assistant.*

COMMITTEE ON THE CORRELATION AND CLASSIFICATION OF SOILS.

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H. H. BENNETT, Inspector, Southern Division.

J. E. LAPHAM, Inspector, Northern Division.

MACY H. LAPHAM, Inspector, Western Division.

J. W. MCKERICHER, *Secretary.*

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LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., March 7, 1914.

SIR: In the extension of the soil survey in the State of Georgia during the field season of 1913 work was undertaken in Gordon County. This work was done in cooperation with the Georgia State College of Agriculture, and the selection of this area was made after conference with State officials.

I have the honor to transmit herewith the manuscript report and map covering this area, and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1913, as provided by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

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MAP.

Soil map, Gordon County sheet, Georgia.

SOIL SURVEY OF GORDON COUNTY, GEORGIA.

By J. O. VEATCH.

DESCRIPTION OF THE AREA.

Location and area.—Gordon County is located in the northwestern part of Georgia. The northern line of the county is about 26 miles from the Tennessee State line and the western boundary about 23 miles from the Alabama line. Calhoun, the county seat and principal town, is about midway between the cities of Chattanooga and Atlanta.

The area of the county is 372 square miles, or 238,080 acres.

Topographic features.—The topography in general is hilly to mountainous, and is characterized by a succession of parallel ridges and valleys. The trend of the more prominent of these is generally northeast-southwest, conforming to the strike of the geologic formations.

The county has an elevation above sea level varying from about 600 feet to a maximum of 1,700 feet.

The county lies principally within the physiographic province known as the Appalachian Valley, a division which extends from central Alabama to southern New York, including the Coosa Valley of Alabama and Georgia, the Great Valley of Tennessee, the Shenandoah Valley of Virginia and Maryland, the Cumberland and Lebanon Valleys of Pennsylvania, and the Kittatinny Valley of New Jersey. The greater part of the county is a valley in that it lies at a lower elevation

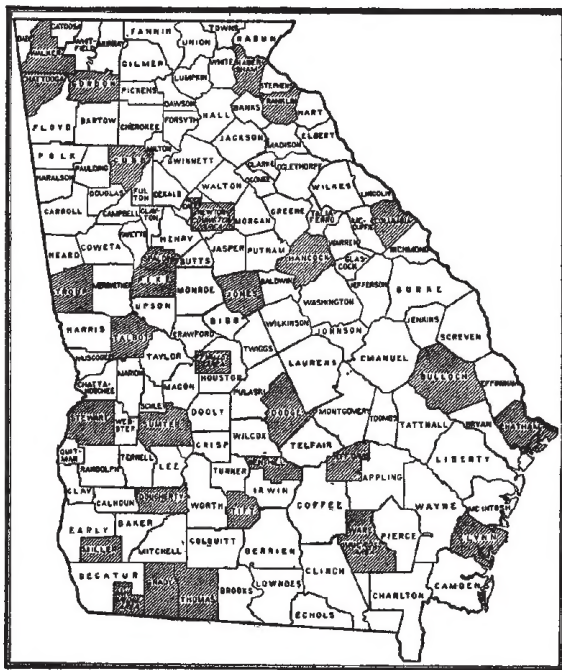


FIG. 1.—Sketch map showing areas surveyed in Georgia.

than the Cumberland and Allegheny Plateaus on the west and the Appalachian Mountains on the east. However, the valley itself is composed of a succession of ridges and minor valleys. Some of the ridges exhibit a very rough topography and reach such elevations above the adjacent valleys as to be appropriately styled mountains.

A narrow strip of mountainous land 3 to 5 miles wide in the extreme eastern part of the county is considered to be part of the Appalachian Mountains province. This province is one of the major physiographic divisions of the eastern United States, including the Blue Ridge on the east, the Cohutta Mountains in Georgia, the Great Smoky Mountains of Tennessee and North Carolina, and smaller mountain groups in Pennsylvania and New Jersey.

The rocks in the Appalachian Valley are wholly sedimentary, consisting principally of limestones, shales, and sandstones; the rocks of the Appalachian Mountains are mainly crystalline, consisting of igneous and metamorphic strata.

There are three principal topographic divisions in the Gordon County area. A narrow mountainous division, consisting of Horn and John Mountains, extends practically the entire width of the county along the western boundary; a second mountainous area, a portion of the Appalachian Mountains province, occupies the extreme eastern part, while between these two mountainous divisions there is a great valley, approximately 20 miles in width.

Horn Mountain is a narrow-topped, even-crested anticlinal ridge of resistant sandstone and chert rising 700 to 800 feet above the valley on the east, and reaching a maximum elevation above sea level of 1,600 feet. The slopes of the mountain both on the east and west are steep and generally covered with large rock fragments. Narrow, rocky, gorgelike ravines have worked back practically to the top of the mountain, leaving only a very narrow crest in many places hardly one-fourth mile wide.

John Mountain, a small part of which lies in Gordon County, is west of and parallel to Horn Mountain; it is underlain by much the same character of rock and is similar in origin and topography. The two mountains are separated on the north by a deep valley, occupied by the head branches of John Creek, known as "The Pocket."

The Pocket is rather inaccessible, but contains a considerable amount of arable land, which for the most part has been cleared and placed under cultivation. The valley is underlain largely by calcareous rocks, whereas the rock on the mountains is mainly sandstone.

On the south the two mountains are separated by the valley of Rocky Creek. The head branches of the creek have cut deep, narrow, rocky coves, but the valley widens to about 2 miles at the southern ends of the mountains. The valley floor is covered by gravel debris, but the soil is fairly productive, and most of the land can be

placed under cultivation. The head branches of Rocky Creek and John Creek approach within one-half to three-fourths mile of each other, leaving only a very narrow drainage divide uniting the two mountains. Thus what was probably originally one mountain mass has been almost completely severed by rock decay and erosion.

The mountains are thickly forested with pine, oak, hickory, and other woods. Practically all of the land is too rough, stony, or inaccessible to be of much value at present for agricultural use.

The broad central valley area, lying between Horn Mountain and the Appalachian Mountain division of the eastern part of the county, has a general elevation of 750 to 950 feet above sea level, or, roughly, 400 to 700 feet lower than the inclosing high lands. Viewed from the top of Horn Mountain, or the higher ridges on the east, this valley region appears as a great, broad, level plain. In reality, however, it is composed of low ridges or lines of hills, alternating with minor valleys.

The central valley is underlain entirely by sedimentary strata, consisting of shales and limestone, with a less amount of sandstone and chert. The beds have in past geologic ages been compressed into a succession of folds, with the long axes having a northward-southward direction; in addition to folding, faulting has been extensive and the beds are not everywhere in sequence according to age. The rock folds have been planed off by erosion and the hard rock concealed by soil covering so that the structure is not readily apparent and can be deciphered only by detailed geologic study. The present topography and drainage are interlinked in their history with the history of the rock structure and in turn the present soils bear a close relation to the topography as well as to the character of the underlying rocks. In general, the arenaceous shales and sandstones, the cherty limestones, and the slates form ridges or hills, while the purer limestones and the softer shales underlie the minor valleys and produce the more arable and fertile soils. There are several minor topographic divisions in the central valley which are of local interest in their relation to the agriculture of the county.

Directly east of Horn Mountain there is a narrow, poorly defined valley, traversed by Snake Creek and in part by Oostanaula River. This lowland area is underlain principally by soft shales, together with a small amount of chert and limestone, and contains a large area of good farming land. The shales underlie the so-called flatwoods, while the chert or cherty limestone has produced hills or ridges parallel to Horn Mountain. Baugh Mountain, a short distance southwest of Sugar Valley, is a conspicuous elevation in this lowland area. For a distance of 1 to 3 miles east of the base of Horn Mountain the land is thickly covered with sandstone and chert gravel washed from the mountain slopes.

The lowland area, described in the preceding paragraph, is limited on the east by a narrow ridge, or chain of hills, which extend entirely across the county from the Whitfield County line about 3 miles north of Resaca southwestwardly to Plainville and thence into Floyd County. The underlying rock is gray and purplish sandstone and arenaceous shales which produce thin shale loam soils of low agricultural value.

Continuing eastward, there is a shale belt, only a mile or so wide in the southern part of the county, east of Plainville, which broadens out near Calhoun and Resaca into one of the more prominent divisions of the county. The topography of this belt is undulating, consisting of low rounded shale hills and narrow complementary valleys generally underlain by thin lenses of limestone.

The next conspicuous topographic feature is a high ridge extending from the southern line of the county northeastward to the town of Calhoun and thence as a very narrow ridge to the Oostanaula River a short distance above the town of Resaca. This belt reaches, in its highest part, an elevation of 1,000 feet above sea level. It is underlain by cherty dolomite which produces a gray gravelly soil.

Oothkalooga Valley, a narrow lowland area, traversed by Oothkalooga Creek, extends from Adairsville in Bartow County to Calhoun. The valley is underlain by Cambrian limestone, interbedded with shale, which gives rise to red and brown soils of the Decatur and Hagerstown series, the most durable and fertile upland soils of the county. This valley was one of the first settled parts of the county. It has a general elevation of about 700 feet above sea level or roughly about 200 feet lower than the inclosing cherty limestone ridges.

The most conspicuous feature of the central part of the county is a high, gravelly, broad ridge extending entirely across the county, its continuity being broken only where it is crossed by the Coosawattee River. This area is underlain by cherty magnesian limestone, which in the process of weathering has left a soil strewn with small angular particles and large fragments of grayish chert. This soil is locally known as the "gray gravelly land." The ridge reaches a width of 4 to 5 miles west of Sonoraville, but narrows to about a mile where it enters Murray County, a short distance west of Midway. The elevation above sea level varies from about 800 feet in the northern part to 900 and a maximum of 1,000 feet near the southern line of the county. The land is rolling to hilly, but is nowhere too rough for cultivation. It is well drained, although there are fewer surface streams than in other parts of the county, a large part of the rainfall being absorbed by the porous mantle of rock decay, which here reaches a great thickness. A broad, ill-defined, shallow depression, in which the soil is sandy, extending from near Crane Eater to a short

distance south of Farmville is known locally as Dry Valley. There are only a few perennial surface streams in this area and the level of ground water is at a somewhat greater depth than on other parts of the ridge.

The country to the east of the central gravelly ridge is a level to gently undulating belt which, adjacent to the larger streams, has been cut into innumerable low, rounded hills by the small tributary branches. This area is underlain by argillaceous and calcareous shales, in places interbedded with thin layers of limestone. The land is well drained and entirely arable, but a large percentage of the soil is thin and shaly and of low productivity. This division includes the villages of Sonoraville, Redbud, and Fidelle. It is from 3 to 7 miles in width and has an elevation of 700 to 800 feet above sea level.

A hilly belt of greenish slates next appears eastward. This belt is 2 to 4 miles wide, the western edge lying 3 or 4 miles east of Redbud and Sonoraville. The topography is much rougher than that of the shale area to the west, the land being minutely dissected by small branches and hollows, most of which are dry during the summer. The hill slopes are steep and the soils thin. This area is sparsely settled and much the greater part of it remains in forest. The soil supports a rather small but thick growth of shortleaf pine, oak, and hickory. The surface has an average elevation of 800 to 900 feet above sea level.

A narrow longitudinal valley, in which the towns of Fairmount, Ranger, and Oakman are located, borders the slate hill belt on the east. The strata in this valley are largely calcareous, which probably accounts for its lower elevation. Much of the soil is derived entirely from limestone and there are also considerable tracts of rich alluvial soil along Sallacoa Creek, which traverses a part of the valley. The topography is gently undulating, with low, rounded shale hills rising above the limestone and creek lowlands. This valley was occupied by white settlers early in the history of the county. The land is well watered, the soils fertile, and transportation by wagon roads less difficult than in the country to the east or west.

The central valley division of the county includes much the greater part of the more arable and fertile land and nearly the whole population is distributed over this topographical division.

The central valley terminates on the east with the Fairmount-Ranger Valley. The mountainous land of the Appalachian Mountain division thence rises abruptly 500 to 600 feet above the lowland on the west and attains a maximum elevation, in Gordon County, of about 1,700 feet above sea level. The surface is minutely and deeply dissected by small streams, so that only a few level tracts remain on the narrow stream divides. This division is underlain by mica schists,

quartz schists, and semicrystalline slates. The soils are naturally fertile, but are stony. On account of the steep slopes and generally rough topography most of the land is unimproved and the region thinly settled. The mountain land is covered with a growth of short-leaf pine, oak, hickory, and chestnut on the ridges, with a large individual tree growth of poplar, tulip, gum, beech, and scattered white pine in the coves and on the low, moist slopes.

Drainage.—The county lies entirely within the drainage basin of the Oostanaula River and its principal forks the Coosawattee and Conasauga Rivers. The Oostanaula and Coosawattee are large streams and were formerly navigable for small boats as far as Carters, Murray County. The Coosawattee enters the northeastern corner of the county and pursues a winding southwestward course, uniting with the Conasauga about 5 miles northeast of Calhoun to form the Oostanaula. The Oostanaula continues a meandering course to the southwestern corner of the county, thence into Floyd County, where it unites with the Etowah to form the Coosa. The tributary streams nearly all have northward or southward courses in conformity to the geologic structure and topographic features, while the rivers have assumed courses apparently quite independent of both, flowing across ridges and at right angles to the strike of the rocks.

All of the larger branches and creeks are perennial and afford potable water for farm stock. The flood plains of the streams are generally narrow, the only considerable areas of bottom land being along the Oostanaula, Coosawattee, and Conasauga Rivers and Sallacoa Creek. The bottom land along the rivers is 15 to 20 feet above ordinary stages of the water, and is not subject to complete inundation except at infrequent intervals, most of the overflows occurring during the winter months. The alluvial land along the smaller streams is only 4 to 10 feet above the stream levels, and is subject to more frequent complete overflows. There is no swamp and all of the bottom land can be easily placed under cultivation. The width of the alluvial bottoms along the rivers varies from one-fourth mile to $1\frac{1}{2}$ miles. Remnants of a high fluvial terrace plain, 50 to 75 feet above the present flood plains, appears along the courses of the rivers, while a low terrace or bench, 10 to 15 feet above the flood plains, formerly existed, although now almost completely obliterated by erosion.

Water supply.—Most of the water supply for farm use is obtained from ordinary dug wells 20 to 60 feet in depth. The supply rarely fails at these depths except on the gravelly ridges of the central part of the county. There are a number of permanent springs in the limestone areas and in the mountains, some of which have large flows, but throughout the shale belts, which occupy the largest part of the area, springs are small, of rare occurrence, and of little value as a source of water for domestic use. A few scattered lime-sink ponds appear in

the cherty limestone area in the central part of the county. There are two artesian flowing wells in the county, but in general the geologic conditions are unfavorable for successful deep wells.

Population and industries.—The present area of Gordon County was originally a part of the old county of Cherokee, which was finally relinquished by the Cherokee Indians under the terms of the Schermerhorn treaty of 1835. However, as early as 1830 or 1831 the region was beginning to be occupied by white settlers. Gordon County was laid out from Floyd and the old county of Cass, now Bartow, in 1850. The early settlers were almost entirely of Anglo-Saxon descent, coming mainly from South Carolina, Tennessee, and central Georgia. The present white inhabitants are descended mainly from the early settlers, there being no foreign element and only a small negro population. The population in 1850 was 5,156 white and 828 negro; the present population, according to the census of 1910, is 15,681. Calhoun, located in the west-central part of the county, is the principal town and local market for farm products. It has, according to the last census, 1,654 inhabitants.

Agriculture is the chief occupation of the people. A considerable lumber industry, however, is still carried on and there are a few small manufacturing industries at Calhoun.

Transportation facilities.—The greater part of the county is supplied with adequate railway facilities. The Western & Atlantic Railroad traverses the central part, passing through Calhoun, and furnishes quick transportation to the cities of Atlanta and Chattanooga. The main line of the Southern Railway between Atlanta and Chattanooga crosses the western part of the county and the Louisville & Nashville Railroad crosses the eastern part.

The public wagon roads are sufficient in number and traverse all parts of the county. However, they are not always maintained in good repair and the grades are in many places unnecessarily steep. The close relation between good roads and agricultural prosperity is beginning to be realized and movements for a better system of county roads are being agitated by the more progressive citizens.

CLIMATE.

The climate of Gordon County is mild and healthful. The summers are long, but there are few very hot, sultry periods, and extreme cold is not experienced during the winter. The average annual rainfall is about 48 inches, and the rains are generally well distributed throughout the growing season, so that crop failures on account of drought or excessive rain are of rare occurrence. The growing season, or period between killing frosts in the spring and in the autumn, is, on the average, about $6\frac{1}{2}$ months, which will permit the cultivation of a wide variety of crops. Cotton, the principal crop, is grown

with safety, except on the high mountain land or on low, heavy bottom land, and by selecting early maturing varieties even in these situations cotton can be grown with success.

The following table of climatic data has been compiled from the records of the Weather Bureau station at Adairsville, Bartow County, which is only a few miles south of the Gordon County area:

Normal monthly, seasonal, and annual temperature and precipitation at Adairsville, Bartow County.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	<i>° F.</i>	<i>° F.</i>	<i>° F.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
December.....	42.2	72	5	4.86	6.89	5.22	.....
January.....	40.6	74	— 1	4.35	4.40	6.67	.....
February.....	41.2	77	— 8	5.41	4.91	.90	.....
Winter.....	41.3	.....	.....	14.62	16.20	12.79	.....
March.....	53.1	86	6	5.68	3.14	9.81	.....
April.....	59.5	92	28	3.83	2.49	1.88	.....
May.....	69.6	94	37	3.28	1.78	2.99	.....
Spring.....	60.7	.....	.....	12.79	7.41	14.68	.....
June.....	76.0	99	41	3.48	2.57	7.38	.....
July.....	78.6	102	56	5.42	3.18	10.32	.....
August.....	77.9	99	55	4.17	2.65	2.97	.....
Summer.....	77.5	.....	.....	13.07	8.40	20.67	.....
September.....	72.6	97	40	3.22	1.29	6.30	.....
October.....	61.0	88	26	2.27	1.69	4.29	.....
November.....	50.3	77	19	2.97	1.20	6.23	.....
Fall.....	61.3	.....	.....	8.46	4.18	16.82	.....
Year.....	60.2	102	— 8	48.94	36.19	64.96	.....

Average date of first killing frost in autumn, Oct. 27; of last in spring, Apr. 5. Earliest date of killing frost in autumn, Oct. 11; of latest in spring, Apr. 24.

AGRICULTURE.

The history of the agriculture of Gordon County is similar to that of practically all of the inland agricultural communities of the eastern United States. The first settlers from necessity followed a mixed system of farming, which supplied their food and in a limited way all other articles of domestic use which could be produced under their natural environment. With the advent of transportation facilities and access to the markets of the centers of population the system of farming gradually changed, the tendency being to grow those crops which were best adapted to the soil and climate or which offered the

greatest financial returns, the food and articles of home use formerly laboriously produced on the farm under unfavorable conditions being purchased from those sections of the country in which they could be produced or manufactured with greater economy.

A system of general farming, restricted because of the exactions of the principal money crop, cotton, is practiced. There are very few special crops, and the total value of these is comparatively small. A variety of staple crops are grown on most individual farms, although there has been an increasing tendency to devote the greatest efforts and acreage to cotton, many of the farmers not producing sufficient forage and grain for their own use. But little attention is given to stock raising and dairying.

The more important crops grown at present are cotton, corn, oats, and wheat; there is a small acreage utilized for forage crops and a small production of sorghum sirup and miscellaneous vegetables. Peach growing is the only important special industry, and this has lately greatly declined on account of unfavorable conditions for marketing the fruit.

Cotton is the principal money crop and probably the largest acreage of improved land is utilized for this staple. The last census (1910) gives the acreage of cotton 22,840, or 556 acres less than that of corn. However, on account of prevailing good prices the tendency has been to increase the cotton acreage, and at the present time, without much doubt, it exceeds that of corn. Cotton has largely supplanted wheat on the old farms and practically all of the newly improved land has been cleared primarily for cotton farming. Cotton is planted on all of the different types of arable soils except low-lying poorly drained bottom land, the yields ranging from one-fourth bale, or even less on certain thin shale soils, to as much as $1\frac{1}{2}$ bales on the more fertile limestone soils and river bottom land.

The principal varieties of cotton now grown are Mortgage Lifter, Cleveland, and Russell. These are big-boll varieties commonly grown on the uplands and also to some extent in the stream valleys. Broadwell and King's Improved, small-boll, early maturing varieties, are favored for the alluvial bottom lands. Very few farmers, however, exercise much care in maintaining varieties pure or make a practice of careful seed selection.

Commercial fertilizers are universally used for this crop on all of the different types of soils, the most common grade being 10-2-2.¹ The usual applications are 150 to 300 pounds per acre.

Corn, next to cotton, has the highest money value of the county's agricultural products. As in the case of cotton it is grown on all of the different types of soils, notwithstanding that much of the land is poorly adapted to this crop. The average yields range from 10 to 50

¹Ten per cent phosphoric acid, 2 per cent nitrogen, 2 per cent potash.

bushels per acre, the highest being obtained on the alluvial soils along the Coosawattee and Oostanaula Rivers. The average yield for the county is very low according to the census (1910) statistics, being only 14 bushels per acre. The low average yield is partly attributable to the fact that this grain is grown on the steep slopes of shale hills and on other unfavorable soils, but mainly to injudicious fertilization or neglect of cultivation or proper preparation of the land, since yields are also low on soils excellently adapted to this crop. Marlboro, Hastings Prolific, Shaw, and Tennessee Red Cob are some of the varieties grown. Most of the farmers, however, are indifferent about pure varieties and seed selection. Commercial fertilizers are used on corn, usually at the rate of 100 to 200 pounds per acre, except on the more fertile creek and river bottom land. It is the common practice to pull the leaves from the corn stalks for fodder late in August or early in September. Only a very few farmers cut and shock their corn. Cowpeas are very often sown in the corn at the time of the last cultivation, the seed only being gathered, while the vines are turned under for manure.

Oats are as yet an unimportant crop in comparison with corn and cotton, but the acreage is increasing and farmers will doubtless find it profitable to devote more attention to this grain, because of its value in a rotation system, its service both for a winter cover crop and for pasturage, and its adaptability to nearly all types of soils. Oats are generally planted in the fall, very frequently between the cotton and corn rows before these crops are completely harvested. Rust-proof varieties thrive best, the Appler probably being the variety most commonly selected. According to the last census there were 4,693 acres in oats, with an average yield of about 14 bushels. Small amounts of commercial fertilizers are commonly applied.

Wheat is grown only in small fields. The acreage has decreased to such an extent that it is now a less important crop than oats. The yields were never large and cotton has been found to be much more profitable, so that this grain is no longer grown as a money crop.

Rye is grown to a small extent. An increase in the acreage of this grain might be found advantageous, since it is about as successful a winter cover crop, especially after cotton, as can be grown in this section and in addition affords winter pasturage and can be turned under in the spring to supply organic matter to the soil. Rye at present is principally utilized for feed in the straw and is not generally thrashed for the grain.

The cowpea is the principal forage crop grown. The seed is sown broadcast, frequently in oat stubble. This legume is cut for hay, and with the exception of that planted in the corn, the vines are not commonly turned under to supply humus. Many farmers sow a mixture of cowpeas and sorghum for forage with good results.

Cowpeas will do well on all of the more arable soils and can generally be grown without commercial fertilizer, although it would doubtless be profitable to fertilize the crop on certain soils where it is grown entirely for hay.

Sorghum is grown both for sirup and as a forage crop. For forage the fields are small, on most farms from one-half acre to 10 acres, and the yields vary from 1 to 2½ tons per acre. The sorghum cane yields from about 75 to 200 gallons of sirup per acre, depending upon the character of the soil and amount of fertilizer used. Sorghum thrives best on the low-lying moist soils.

Red clover, millet, soy beans, and alfalfa are grown only in a very small or as yet experimental way. There is, however, much land in the county well suited to these plants, and it is believed that farmers would find it profitable to devote a greater acreage to these and other forage crops. Lespedeza or Japan clover grows wild and might be cultivated successfully on certain thin shale soils poorly adapted to crops requiring tillage.

Nearly every farm has a small vegetable garden for home use, and there is generally a small surplus of garden truck sufficient for the supply of the towns of the county. No special trucking industry has been developed.

Large peach orchards were established several years ago and were for a while financially successful. The industry has declined lately and many growers have cut down their trees and have utilized the land for cotton and corn. The decline of the peach industry has been due to unfavorable market conditions, since both soils and climate are suitable for good yields and quality of fruit. The "gray gravelly ridges," Clarksville gravelly loam, seems to be most favorably located and best adapted for peaches. Orchards, however, were also established on the Decatur clay loam and several other soil types. Small apple orchards to supply fruit for home use are found on most farms. This fruit seems to do well on nearly all of the soils, except the poorly drained land and on the thin shale soils. It is suggested that apples might be made a profitable crop on the more favorably located mountain lands in the eastern and western parts of the county.

Very little attention is given to stock raising and dairying.

In general no definite or established system of crop rotation exists and, as is true throughout most of the South, corn and cotton are on many farms grown for several years in succession on the same fields. The more intelligent farmers, however, realize the value of a rotation which includes a legume and are beginning to operate accordingly. A few farmers follow corn with oats and the oats with cowpeas, and the succeeding year place the land in cotton. This plan seems to give good results.

Commercial fertilizers are in general use for all of the important crops, except cowpeas. According to the last census (1910) the expenditure for fertilizers was \$48,344. The amount used is increasing rapidly, largely on account of the increasing cotton acreage and on account of the necessity of offsetting soil deterioration occasioned by abuse of the land. Very little barnyard manure is used, for the reason that there is little dairying or cattle feeding, and consequently little manure is produced. The use of lime is almost wholly neglected.

The last census statistics (1910) show 198,253 acres in farms, with 101,067 acres of improved land. The average size of the farms at that time was 74.6 acres. Sixty-one per cent of the farms were operated by tenants. There has probably been a slight increase in the number of tenant farmers.

Under the prevailing system of tenancy the landowner receives one-fourth of the cotton and one-third of the corn and other crops, and supplies a proportional share of the fertilizers. The tenant furnishes the stock, farm implements, and labor. Highly productive land, such as the fertile river bottom land, is often rented for cash.

Farm labor is considered scarce, although there is only a small demand for it. The farms are not large and most of the small landowners and tenants manage to carry on farming operations with the assistance of their families. Day laborers are paid 75 cents to \$1 a day, including one or two meals. The wages by the month are about \$15. Women and children do much of the light labor, such as hoeing and picking cotton.

The selling price of the better improved farming land varies from \$20 to \$100 an acre, depending upon the quality of the soil and location. The highest priced lands are in the limestone valleys near the railways and in the bottoms along the rivers and largest creeks. There are large areas of shale soils in the northern and central parts of the county which have a selling price of \$10 to \$30 an acre. Rough mountainous lands in the eastern and western parts of the county have a present value of \$3 to \$15 an acre.

The crop yields of the county as a whole are low, considering the favorable climate and original natural fertility of the soils. Very similar soils in other States to the north are returning considerably larger yields of the same crops as grown here, except cotton, while a number of individual examples of success in this and adjacent counties convincingly demonstrate that much greater average yields are possible simply by the application of the well-established principles of agricultural science, such as crop rotation, seed selection, deep plowing, and maintenance of the humus supply.

The cultivated soils of the county, with very few exceptions, are notably deficient in organic matter. Under the present system of farming organic matter can best be supplied in the form of green

manure, cowpeas probably being the most useful plant for this purpose and one which is best adapted to the soil and climate. Barnyard or animal manure would do much toward improving and maintaining the fertility of the land, but only scant amounts are produced at present.

As crop yields decrease commercial fertilizers are applied. Many farmers are discovering, however, that while good yields may be obtained for short periods by the use of mineral fertilizers, some form of organic matter must be supplied to supplement them and keep the soil in good physical condition. The use of commercial fertilizers is firmly established and they are regarded as essential in the maintenance of profitable yields under the prevailing system of farming. The same grades of fertilizers are commonly and rather indiscriminately used on the different soil types and for different crops.

SOILS.

Gordon County possesses a great diversity of soils, practically all of which are arable, generally well drained, fertile, and capable of producing a great variety of crops. Most of the soils are residual in origin; that is, they have remained more or less in their place of origin and represent the decay of the rocks which lie directly beneath them. Alluvial soils occupy a large area and form some of the most productive soils of the county. This class represents original residual soil material which has been washed from the land within the drainage basins of the streams and redeposited in the flood plains throughout their courses. Colluvial soils are of less areal extent than the other two classes; these soils represent material which has slowly moved short distances from higher to lower topographic positions by the action of gravity aided by rainfall run-off, frost, and other agencies. This class is thus intermediate between residual and alluvial soils. Colluvial accumulations of variable extent occur at the base of practically every hill and mountain slope.

Texturally the loam and silt loam classes of soil predominate, while there is only a comparatively small amount of sandy and heavy clay soils.

Soils are composed mainly of inorganic matter, the amount of plant and animal matter, with negligible exceptions, being in comparison quite small. This inorganic or mineral matter is derived from the decay of the rocks of the earth's crust. There is therefore a basic relation between soils and rocks, and it follows that a clear understanding of the chemical and physical character of soils and a consistent scientific classification is not possible without a knowledge of the material whence the soils have come. Primary variations in chemical and physical character are due to differences in amount,

size and shape, chemical composition, and freshness or stages of decomposition of the mineral particles, all of which bear an intimate relation to the lithologic character of the parent rock or rocks and geological history of the soil. Peculiarities of plant growth and soil character become more intelligible where the structure of the parent rock, the depth of weathering, and the nature of the substratum and subsurface moisture or drainage conditions are understood.

The rocks of Gordon County are of sedimentary origin. Shales, limestones, and sandstone are the principal classes, while a smaller area of highly metamorphosed rocks consisting of semicrystalline slates and schists are present. The rocks have undergone great structural disturbances and the beds are generally inclined at high angles. Faulting has been extensive and beds are not everywhere in sequence according to age.

The rocks have been classified by geologists on the basis of their age or period in the geologic history of the world in which they were formed. Subdivisions are called "formations," and are generally given some geographic name to distinguish them and to simplify description. The lithologic character of rocks, however, is of immediate importance in the study of the soils, rather than the age of the formation, although a knowledge of the age of rocks has its value in the correlation of soils and a discussion of their history.

The rocks of Gordon County range in age from Lower Cambrian to Carboniferous, thence with a gap to Pliocene (?) and Quaternary. Practically all of the county has been land surface since Carboniferous times.

The oldest rocks are the semicrystalline slates and micaceous schists which occupy the Appalachian Mountain province of the extreme eastern part of the county. The rocks are greenish sericitic schists, graphitic or carbonaceous slates and schists, quartz schist, and graywacke. They represent metamorphosed sediments of Lower Cambrian age and are probably a part of the old Ocoee series.¹

The Rome formation of Cambrian age consists of gray, purple, and yellowish, highly arenaceous, minutely jointed shales and a small amount of fine-grained sandstone.

The Conasauga formation of Cambrian age occupies the largest area in the county and produces a great variety of soils. The formation is composed of both argillaceous and calcareous fine-grained shales and slate of an olive-green or drab color, which weather to a yellowish brown or red. The beds have been highly folded and are dipping at high angles. Bluish-black, hard limestone, generally

¹ The Ocoee series, according to recent stratigraphic studies, has been divided into a number of formations and is regarded as Lower Cambrian on the basis of physical relationship to known Cambrian strata of the Appalachian Valley. (Index to the Stratigraphy of North America, Professional Paper 71, U. S. Geological Survey, p. 89.)

veined with white calcite, occurs in the formation in lenses of considerable thickness or in very thin layers closely interstratified with the shale.

The Knox dolomite formation of Cambro-Ordovician age consists in the upper part of massive bedded, gray crystalline magnesian limestone or dolomite containing layers and nodules of gray chert. A smaller thickness in the lower part of the formation consists of less cherty magnesian limestone. A phase in the central part of this county consists of interbedded dolomite and gray sandstone. This formation has a wide areal distribution.

The Chickamauga formation consists principally of bluish, fine-grained limestone, with possibly some interbedded shale. The rock is of Ordovician age.

The Rockwood formation is composed of a brown and red sandstone member which occupies the crests and upper slopes of Horn and John Mountains and a lower member of thin-bedded, flaggy, quartzitic sandstone and interbedded grayish, yellowish, and purplish argillaceous and siliceous shale.

Devonian rocks are present in the county but are very thin and have exerted but little influence on the character of the soils. According to the mapping in the Rome folio of the United States Geological Survey, the Armuchee chert and the Chattanooga shale are present on the southern ends of Horn and John Mountains.

The Fort Payne chert formation of Carboniferous (Mississippian) age appears in the northwestern part of the county. The formation consists of thin-bedded chert with a smaller amount of siliceous limestone.

The Floyd formation, of Carboniferous (Mississippian) age, consists principally of fine-grained, thinly laminated, bluish, or brown to black carbonaceous shales. The shales are calcareous in places and there is a small amount of interbedded limestone. The shales are softer and less metamorphosed than those of the Conasauga formation.

Deposits of fluvial origin are found on a high terrace 50 to 100 feet above the rivers. The material consists of highly ferruginous red silty loam or clay loam mixed with water-worn gravel. The deposit is probably Pliocene or early Pleistocene in age. The low-lying alluvium along the streams is Quaternary in age. It is of variable character, depending upon the sources of the material and conditions of deposition.

In the classification of soils for the purposes of mapping they have been separated into series on the basis of a common origin and of similar characteristics of color, structure, and topography. The soil type, a subdivision of the series, is based on the texture of the soil material or the relative amounts of different sized particles, as sand,

silt, and clay. Upon this basis of mapping 21 different series and 39 types, exclusive of Rough stony land, have been differentiated in the Gordon County area.

Brief descriptions of the soil series and detailed descriptions of types and of the agriculture in relation to each type will be found in the following pages.

The table below gives the names and extent of the various soils mapped in Gordon County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Conasauga shale loam	35,840	15.1	Clarksville silt loam	3,136	1.3
Clarksville gravelly loam	25,664	10.8	Talladega clay loam	3,072	1.3
Armuchee shale loam	16,064	6.7	Christian fine sandy loam	2,944	1.2
Conasauga silt loam	13,824	5.8	Wickham loam	1,152	1.2
Conasauga loam	7,872	4.5	High terrace phase	1,728	
Light phase	2,880		Rough stony land	2,624	1.1
Armuchee clay loam	9,984	4.2	Huntington fine sandy loam ..	2,432	1.0
Talladega slate loam	9,536	4.0	Hanceville stony loam	2,048	.9
Huntington silt loam	8,192	3.5	Holston fine sandy loam	2,048	.9
Decatur clay loam	7,872	3.3	Holston silt loam	1,920	.8
Colbert silt loam	7,104	3.0	Toxaway fine sandy loam	1,920	.8
Shackleton fine sandy loam ..	7,104	3.0	Toxaway silt loam	1,536	.6
Murrill gravelly loam	7,104	3.0	Hagerstown gravelly loam	1,216	.5
Huntington silty clay loam ..	6,656	2.8	Dekalb stony silt loam	1,088	.5
Hagerstown silt loam	6,272	2.6	Huntington gravelly loam	960	.4
Colbert shale loam	5,952	2.5	Holly silt loam	768	.3
Colbert silty clay loam	5,824	2.4	Armuchee silt loam	576	.2
Hanceville gravelly loam	5,376	2.3	Tyler silt loam	512	.2
Ranger slate loam	4,288	1.8	Decatur loam	512	.2
Decatur cherty loam	4,096	1.7	Hollywood clay	448	.2
Montevallo shale loam	4,032	1.7			
Clarksville stony loam	3,904	1.7			
			Total	238,080	.....

GRAY SOILS.

RESIDUAL MATERIAL—LIMESTONE.

CLARKSVILLE SERIES.

Most of the land locally designated as "gray gravelly land" is included in the Clarksville series. This series comprises grayish cherty soils with yellow clay subsoils and red substrata. The soils are commonly gravelly from chert fragments; they are derived from cherty magnesian limestones or dolomite of the Knox formation and the chert and limestones of the Fort Payne formation. The series occupies ridges, forming the higher upland of the central valley division of the county, and also appears on the steep slopes and foothills of Horn Mountain. In its areal extent the Clarksville series ranks next to the Conasauga series.

CLARKSVILLE GRAVELLY LOAM.

The Clarksville gravelly loam includes most of the land of north-west Georgia commonly designated as "gray gravelly ridges." The soil in the Gordon County area typically consists of 8 to 10 inches of gray to grayish-brown silt loam or silty loam, underlain by light-yellow, friable, heavier silt loam to silty clay loam which grades usually into a yellow or reddish-yellow silty clay at about 24 inches. Below 3 feet the residual material consists generally of red or mottled red and yellow clay containing embedded fragments of chert. In places the red clay comes within the 3-foot section, while in other places the yellow material extends to depths of 3 feet or more. This soil characteristically contains a high percentage of gravel, consisting of angular grayish fragments of both porous and dense chert, varying in size from fine gravel to blocks 6 or 8 inches in length. The gravel content is generally higher in the surface than in the subsoil or substratum.

There are a number of minor variations from the type as described, due mainly to differences in topography. On many eroded hill slopes the yellow silty clay loam subsoil is missing or only a few inches in thickness, while the red cherty clay lies within 15 or 20 inches of the surface. Such areas represent a development closely approaching the Decatur cherty loam. The gravel content is also variable; at the base of many steep hillsides the material is apparently simply a mass of chert gravel, as, for example, on the west slope of Baugh Mountain, near Sugar Valley.

The Clarksville gravelly loam in point of areal extent is one of the more important agricultural types of the county, ranking next to the Conasauga shale loam in total acreage. It occurs in well-defined belts having a north-south direction. The principal areas are located on a broad ridge, in the central part of the county, which extends from the Bartow County line, southwest of Sonora, to Crane Eater, and thence northward into Murray County near the old village of Midway. A second rather conspicuous ridge of this soil extends from Oostanaula River east of Resaca to the town of Calhoun, and thence broadens out to the west of McDaniels and Lilypond and continues southwestward into Bartow and Floyd Counties. The type also appears on the slopes and foothills of Horn Mountain, while there are three small isolated areas to the northeast of Sugar Valley and another in The Pocket, in the extreme northwestern part of the county.

The Clarksville gravelly loam occupies the crests and both gentle and steep slopes of ridges and rounded hills which generally rise rather conspicuously 100 to 300 feet above the adjacent valleys. Practically all of the type can be utilized for cultivated crops,

although in many places the slopes are rather steep and rough and the soil is subject to erosion and gullyng.

Areas of this soil in the central part of the county are derived from cherty dolomite or magnesian limestone of the Knox dolomite formation and in the western part of the county, except the area in The Pocket, from interbedded chert and limestone of the Fort Payne chert formation. Throughout the area underlain by the more cherty members of the Knox formation the mantle of residual decay attains a great thickness, 40 to 100 feet in many places, and consequently outcrops of the limestone rock are rarely seen. Chert is abundant at the surface because of its relative insolubility, although it forms only a small proportion of the underlying rock mass. The lower part of the Knox formation consists of a dense, fine-grained, bluish-gray magnesian limestone, less cherty than the upper members, which upon weathering decomposes into a heavy reddish-yellow clay, leaving only a small quantity of chert gravel in the soil. Much of the chert from this member is jet black, dense in structure, and of the nature of jasper.

The native tree growth on the Clarksville gravelly loam consists principally of shortleaf pine, post oak, blackjack, Spanish oak, and hickory, with small amounts of red, white, and black oak. There is a scattered growth of chestnut, chestnut oak, and upland black gum. Blackjack is more abundant on the crests of the gravelly ridges and the individual tree growth is notably more stunted than on the lower slopes.

About 75 per cent of the land is under cultivation, cotton and corn being the principal crops. Fair yields are obtained with the aid of commercial fertilizers, commonly a 10-2-2 grade applied at the rate of 150 to 300 pounds per acre. The average yields are one-fourth to one-half bale of cotton and 15 to 30 bushels of corn per acre, the largest yields of both crops being obtained from the smoother land on the lower slopes. Cotton does not make a very large growth, but fruits fairly well and the bolls mature earlier than on the valley lands. Peaches are successfully grown on this type and there are a number of commercial orchards. The peach industry, however, is at present on the decline, because of unfavorable market conditions, and many of the orchards have been cut down and the land placed in cotton and corn. Strawberries are a successful special crop on this type in Chattooga County, Ga., and would doubtless succeed here.

The soil is generally deficient in humus. It is believed that a greater acreage devoted to cowpeas or other legumes would ultimately be profitable. Scarcely any animal manure is produced in this locality, and organic matter for the soil can best be supplied by turning under green crops.

On portions of the Clarksville belt in other areas cantaloupes and Irish potatoes are being successfully grown.

CLARKSVILLE STONY LOAM.

The Clarksville stony loam in color, structure, and texture of the fine soil material is similar to the gravelly loam type of this series, the size of the residual fragments of chert constituting the chief difference between the two soils. The soil typically consists of 8 to 10 inches of grayish to grayish-brown stony silt loam, underlain by a less stony and gravelly brownish-yellow silty clay loam. Generally the reddish substratum is not as evident as in the gravelly loam areas. The chert fragments vary in size from fine gravel to large blocks 4 or 5 feet across.

The topography is hilly to mountainous. The largest area is found on the steep slopes of Horn Mountain; here the soil occurs in a well-defined belt lying just beneath the Hanceville stony loam and Dekalb stony silt loam areas. Large blocks of sandstone which have rolled down from the higher slopes occupied by the Hanceville and Dekalb are scattered over the Clarksville surface. This type is also present on the ridges or high knobs which lie a short distance eastward from Horn Mountain. A few small areas of the stony loam also appear on the Clarksville gravelly loam ridges in the central part of the county, although most of these, on account of their small size, are not shown separately on the soil map.

Most of the Clarksville stony loam type is derived from the Fort Payne chert formation, which along the base of Horn Mountain consists almost entirely of thin-bedded grayish chert. On the chain of low hills or cherty knobs which lie to the eastward of and parallel to the mountain the formation contains some interbedded limestone.

Most of the land is too rough or stony to be of any value for cultivated crops. Cotton and corn, however, can be grown on the more arable phases, and the more accessible land might be utilized for orchards.

CLARKSVILLE SILT LOAM.

The Clarksville silt loam consists of 8 to 10 inches of gray to grayish-brown silt loam, underlain by pale-yellow silty clay loam to a depth of 15 to 18 inches. Beneath this occurs a moderately plastic and compact yellow silty clay, which generally grades into a red or reddish and yellowish mottled clay at about 3 feet. A few fragments of grayish or black chert are normally present, both in the surface soil and subsoil, and on gentle slopes where considerable soil material has been washed from adjacent gravelly ridges angular chert fragments are fairly abundant, but hardly in sufficient amounts to constitute a gravelly loam.

This type occupies smooth slopes, shallow drainage depressions, and in general the gently undulating and less hilly parts of the Clarksville areas. The total area of the type is small, amounting to only 4.9 square miles. The principal body is located about 1½ miles east of Calhoun, on the east slope of the cherty ridge which extends southwestwardly from this town. An isolated area lies between Sugar Valley and Resaca, while scattered small tracts occur throughout the areas occupied by the Clarksville series.

The soil is mainly residual and derived from the same rock formations as the members of the series already described. The absence of any considerable amount of chert gravel in the silt loam areas is probably due to the lower chert content in the underlying rock. Some of the soil in shallow drainage depressions is partly colluvial in origin, representing fine material which has been washed from adjacent Clarksville gravelly loam hills.

The Clarksville silt loam is more easily tilled than the gravelly loam type, retains moisture better, and is less susceptible to gulying. It is better adapted for small grain and grasses, and on the whole has a slightly higher agricultural rank than the gravelly or stony loam types. The land is utilized chiefly for cotton and corn; yields of one-half bale of cotton and 20 to 30 bushels of corn are commonly obtained. An experimental field of 1 acre of alfalfa on this type yielded three cuttings and 4 tons of hay.

RESIDUAL MATERIAL—LIMESTONE AND SANDSTONE.

COLBERT SERIES.

The Colbert series is characterized by grayish surface soil material and dull-yellow to brownish, stiff and plastic subsoil clay. The soils are residual from calcareous shales and limestone of the Conasauga formation and fine-grained shales and thin layers of limestone in the Floyd formation. The topography is level to gently undulating or moderately hilly. The Colbert soils differ from the Conasauga chiefly in the stiffer and more impervious character of the subsoil.

COLBERT SILT LOAM.

The Colbert silt loam consists of 8 to 10 inches of light-gray to pale-yellowish, floury silt loam underlain by brownish-yellow to yellow, stiff silty clay loam, which passes below into sticky, yellow, plastic clay, sometimes having a greenish cast. The underlying undecomposed rock is found at depths of about 3 to 4 feet. On the more poorly drained land the soil is very light in color, and there is a rather abrupt change from the loose, ashy silt loam of the surface to the heavy, impervious clay of the subsoil. On the higher land the sur-

face soil has more of a yellow color. The soil naturally has a low content of organic matter or humus. Many small areas can be found where the subsoil has a reddish cast or approaches the character of the Armuchee silt loam. This type differs from the Cenasauga silt loam chiefly in the stiffer and more impervious structure of the subsoil, which is probably due to the more calcareous nature of the parent rock. The subsoil varies in color and structure accordingly as the strata are more or less calcareous, changing from brownish, sticky clay which cracks upon exposure and becomes very hard and crumbly, to the more yellow and more friable silty clay where the lime content in the underlying rocks is low.

The principal areas of this type occur in the northwestern part of the county in the vicinity of Sugar Valley and Hill City. Other small areas were found a few miles east of Calhoun and near Crane Eater and Fidelle.

The topography is level to flat and most of the land is poorly drained. This is the principal type of soil in the so-called "flatwoods" areas of the county. In several localities the soil is developed in long, narrow strips of lowland adjacent to small creeks.

The tree growth consists mainly of shortleaf pine, white oak, post oak, hickory, water oak, black gum, sweet gum, and haw. There is a thick growth, but individual trees are of small size.

This type is at present not much favored for farming purposes, and a large proportion of the area remains uncultivated. The soil is cold and crops are of rather slow growth and late in maturing. On account of poor drainage conditions difficulty is experienced in properly preparing the land for cotton and corn in the spring, and unless carefully tilled the fine silt surface layer tends to harden and crust. Most of the land could be greatly improved by ditching or by the installation of draintile at shallow depths. It is believed that larger applications of phosphates and potash than are at present used would profitably increase yields. Good yields of cotton are obtained on the low knolls which represent the better drained portions of the type. Sorghum does well both for sirup and as a forage crop.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of the Colbert silt loam:

Mechanical analyses of Colbert silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
253017, 2530159....	Soil.....	2.9	4.3	1.7	2.8	3.3	70.3	14.6
253018, 2530160....	Subsoil....	2.6	3.0	1.4	3.2	4.1	44.3	41.2

COLBERT SILTY CLAY LOAM.

The Colbert silty clay loam has a heavier textured surface soil than the silt loam type, but is otherwise similar in color, structure, and origin. The type typically consists of 2 to 4 inches of gray, floury silt loam, underlain by 6 to 8 inches of pale-yellow silty clay loam, beneath which there is a stiff, impervious, plastic brownish-yellow to brown clay. The underlying hard rock is found at about 3 feet, and outcrops are not uncommon. In a few places, where the soil is derived entirely from a certain argillaceous limestone, the clay is notably stiff and has a greenish shade of color next to the rock. Brown and black iron oxide accretions about the size of buckshot are present and so abundant in a few places that the surface soil has a granular, loamy structure.

This type occupies level low-lying areas along small streams and is generally poorly drained. A considerable area lies in the vicinity of Sugar Valley, and a number of small separate tracts were found in association with the Decatur and Hagerstown soils in the limestone valleys south of Calhoun and in the vicinity of Colima, Ranger, and Oakman.

The soil is residual entirely from limestone in some localities and in others from interbedded shale and limestone, the strata belonging to the Conasauga and Floyd formations. Where it is in close association with the Hagerstown silt loam and Decatur clay loam, the same rock seems to give rise to all three soils, the differences in soil character being due to differences in topography and drainage, the Colbert occupying the lower and less thoroughly drained land.

A large proportion of the area is under cultivation, notwithstanding that tillage is rather difficult. Cotton and corn are grown, but the plants are of slow growth and rather late in maturing and tend to rust or french. The land can best be improved by drainage. Fertilizers containing a high percentage of phosphorus and potash will probably give the best results.

COLBERT SHALE LOAM.

The surface soil of the Colbert shale loam consists of 2 or 3 inches of grayish fine silt loam underlain by 4 or 5 inches of grayish-brown to yellowish silt loam to silty clay loam containing a high percentage of small shale fragments which impart a loose, loamy structure. The subsoil is a stiff and crumbly yellowish to yellowish-brown clay containing a high percentage of small flattish and thick gravelly fragments of brown shale. In places where a limestone layer of considerable thickness is present the subsoil is a brownish or even reddish-brown, stiff, waxy clay which cracks upon exposure in the

manner of calcareous clays. In many old fields erosion has removed the fine silty material of the surface, leaving simply a mass of fine, brownish fragments of shale.

The soil layer is everywhere thin, the underlying rock being found at depths of about 30 inches to 3 feet; individual limestone layers, however, are decomposed to greater depths. This type differs from the Conasauga shale loam chiefly in its heavier subsoil; the shale fragments in the soil are smaller on the whole, and the topography more subdued or less hilly.

The principal occurrences of this type are located in the north-central part of the county, within the area inclosed by the Conasauga and Coosawattee Rivers. Several small areas were mapped along Town Creek east of Calhoun and this soil is also found in the shale belt eastward from Hill City and Sugar Valley.

The land in these localities is rolling or gently undulating. The streams have cut their courses hardly more than 40 or 50 feet beneath the upland plain and such erosion as has taken place has produced low, rounded hills with gentle slopes.

The soil is residual from calcareous shales and interbedded argillaceous shale and limestone. The strata belong to the Conasauga formation. In many places the rock consists of olive-green argillaceous shale, thinly laminated and minutely jointed, interbedded with bluish impure limestone in layers one-half to 3 inches to beds 3 or 4 feet in thickness. The thin layers of limestone have not everywhere decomposed in the weathering processes and on many eroded hills thin slabs are mingled with the shale fragments. The calcareous shales, particularly, disintegrate into small splintery or "shoe-peg" fragments, imparting a gravelly rather than a shaly character to the soil.

The tree growth is small and rather scrubby. Shortleaf pine, blackjack oak, post oak, Spanish oak, and hickory are the principal trees. There is a scattered growth of cedar. The blackjack oak seems to attain a larger growth than on any other soil type.

About 50 per cent of the area remains uncultivated. The soil is thin and while the surface is not especially hilly or broken the land is very susceptible to erosion and unless carefully cultivated soon deteriorates. The soil will give the best results only where kept well supplied with organic matter. Rye or oats as a winter cover crop after cotton and corn are recommended. Cotton gives fair yields and is better adapted to this soil than corn. If properly cultivated it is believed that this type will prove to be more productive than the Conasauga or Armuchee shale loam. The land is poorly suited for orchards on account of the thinness of the soil.

SHACKLETON SERIES.

This series is characterized by the gray color of the surface soils and by the pale-yellow or yellow color and brittle, compact structure of the usual clay loam subsoils. The subsoil generally becomes heavier with depth, and often is faintly mottled with gray and shades of yellow and red in the lower part. In Chattooga County, Ga., the soil material is derived from interbedded thin and thick strata of shale and sandstone with frequent strata of a hard cherty shale having the character of flint, and occasional strata of limestone. Fragments of these rocks with chert are of common occurrence. In Gordon County shale does not enter into the formation of this soil. These soils occupy flat valley areas and gently rolling or rolling ridges. In some respects the soils of this series resemble the Clarksville soils.

SHACKLETON FINE SANDY LOAM.

The Shackleton fine sandy loam consists typically of 3 to 5 inches of gray or grayish-brown friable fine sandy loam or loamy fine sand, underlain by pale-yellow fine sandy loam which characteristically grades at 8 to 12 inches into yellow or pale-yellow friable fine sandy clay loam to fine sandy clay. The yellow clay loam changes to an orange or reddish more compact clay loam or clay at about 3 feet. The lower subsoil is usually a yellow, friable, rather compact fine sandy clay, although in places it shows slightly reddish mottlings or has a reddish cast. The substratum generally is a red, friable, compact fine sandy clay frequently slightly mottled with yellow.

On the higher eroded knolls and eroded slopes the lower subsoil below 18 inches or 2 feet is often red. In such cases the soil shows a transition to the Christian fine sandy loam type. Small angular fragments of gray or black chert and yellow or brownish sandstone are scattered over the surface and also appear to a small extent in the subsoil. Sandstone and chert are in nearly the same proportion, but there may be a slightly larger amount of chert. This type occurs in close association with the Clarksville gravelly loam and is similar to that type in color and structure, differing chiefly in texture and in the presence of sandstone fragments.

The topography is rolling or gently undulating and not as rough as that of the gravelly loam type. The principal areas are found in association with the Christian fine sandy loam, in the rather ill-defined gently undulating belt which is known locally as Dry Valley. This belt extends southward from near Crane Eater to a short distance beyond Farmville. The stream valleys are shallow with gentle slopes and the watercourses are dry during a large part of the summer.

The soil is residual from strata of the Knox dolomite formation, which in this locality consist of interbedded magnesian limestone

and sandstone. One of the few good exposures of the parent rock appears in a bluff at Big Spring about 1 mile southwest of Cash. The formation here consists of alternating thin beds of very hard, fine-grained, crystalline, bluish-gray magnesian limestone and grayish, fine-grained sandstone and quartzite, together with a few intercalated layers of black chert 2 to 4 inches in thickness.

This type is largely under cultivation but a few forested areas still remain. The tree growth consists of about the same species as appear on the Clarksville gravelly loam and the character of the growth is similar.

The land is well drained, is easily plowed, and can be kept in good tilth with ordinary care. Cotton, corn, oats, cowpeas, and sorghum are the principal crops grown. The yields of cotton are one-fourth to one-half bale per acre, and of corn 15 to 30 bushels, with applications of 150 to 200 pounds of commercial fertilizers, a 10-2-2 grade being the most common one in use. Cowpeas and sorghum are grown in small fields of 1 to 10 acres. Peanuts, sweet potatoes, and other truck crops do well, although because of an unfavorable location there is little opportunity for developing a special trucking industry.

By incorporating larger amounts of vegetable matter in the soil, either by turning under green crops or by the use of barnyard manure, by deeper plowing, and by the observance of ordinary precautions to prevent erosion, it is believed that this type could be developed into one of the most productive soils of the county. A greater acreage devoted to cowpeas or other legumes would result in the ultimate improvement of the soil. The soil responds readily to fertilizers.

Below are given the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Shackleton fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
2530119.....	Soil.....	0.3	2.9	11.8	45.0	11.6	22.1	5.9
2530120.....	Subsoil.....	.1	2.2	9.2	34.0	11.6	27.3	15.4

RESIDUAL MATERIAL—SHALE, SANDSTONE AND LIMESTONE.

CONASAUGA SERIES.

The Conasauga series comprises gray to brown soils with yellow silty clay loam to silty clay subsoils. The soils are residual from the more argillaceous shales and slates of the Conasauga formation. This series on the whole has only a moderate productivity yet is of great agricultural importance on account of its extent, occupying about 25.4 per cent of the total area of the county. The soils occupy valleys and low rounded hills.

CONASAUGA SHALE LOAM.

The Conasauga shale loam typically consists of about 6 to 8 inches of grayish to pale-yellow silt loam or silty loam, underlain by yellow silty clay loam. This type is characterized by a high percentage of small, flat, splintery and blocklike shale fragments which impart a friable and loamy structure. At about 10 to 20 inches soft partially decomposed shale mixed with varying amounts of yellowish silty clay loam is generally reached. The soil is everywhere thin and in many old cultivated fields, especially those on the steeper slopes, appears simply as a loose mass of shale fragments. The soil material generally grades into hard shale rock at a depth of about 3 feet.

The type as mapped is not entirely uniform, and many small areas can be found in which the soil does not conform strictly to the above description. Small areas of Conasauga silt loam and loam lying at the bases of hills and in shallow drainage depressions between hills have unavoidably been included. In many places the subsoil color shows a variation toward a decided reddish yellow or yellowish red. Some included patches are sufficiently red in the subsoil to represent true Armuchee, but these were too small to map.

The Conasauga shale loam is the most extensive soil type in the county, and is widely distributed throughout the central valley division, occurring in broken north-south belts which extend entirely across the county. The principal areas lie in a broad belt, beginning a short distance east of the villages of Sonoraville and Redbud, thence extending eastward to near Fairmount, Ranger, and Oakman. The shale belt which extends from near Resaca to the west of Calhoun and thence southwestward into Floyd County also contains numerous hills of this type.

The shale loam occurs principally on the tops and slopes of low, rounded hills adjacent to streams or occupies low, continuous but rather minutely dissected ridges. The topography is generally rougher than that of the closely associated silt loam and loam types of the same series.

The Conasauga shale loam as mapped in this county is residual from the more argillaceous shales of the Conasauga formation. The shales are generally thinly laminated, fissile, and minutely jointed, disintegrating into small fragments in the weathering processes. They are olive green or drab in color, weathering into brownish yellow or reddish yellow. The rock is affected but slowly by weathering agencies, and even on the level areas, the hard shale, but little disintegrated, is encountered in place at depths of 3 or 4 feet. The thin and shaly character of the type under discussion, in contrast to the silt loam and loam types derived from the Conasauga shales, is due

to topography, the shale loam areas having been subjected to greater erosion rather than to rock differences.

The hills are covered with a thick growth of shortleaf pine, post oak, hickory, red oak, Spanish oak, blackjack oak, and scattered chestnut and chestnut oak. Shortleaf, loblolly, and Jersey pine greatly predominate over other trees. Individual trees attain only a small growth, probably due to the nearness of the hard shale rock to the surface. A larger growth of white oak, tulip poplar, and gum appears in the hollows. Many of the steeper slopes when placed under cultivation are subject to serious erosion, and unless precautions are taken, the natural humus content is soon depleted and the finer soil material is carried out by rain waters, leaving a comparatively inert mass of shale. The land is well drained and is easily cultivated; the shale fragments maintain the soil in a loose porous condition, yet are not of sufficient size to interfere with plowing, and being soft, do not exert any great wear upon farm implements. Crops, however, are more likely to be affected by drought than on the valley lands.

Cotton, corn, and oats are practically the only crops grown. On land which has been carefully cultivated, yields of one-half bale of cotton per acre have been obtained, although the average yields are but little more than one-fourth bale. This soil type is poorly adapted for corn and the yields are very low. It is advisable to keep soil of this character well supplied with organic matter and to plant a winter cover crop after cotton and corn in order to lessen the destructive washing which takes place during the winter months. Many of the steeper slopes which have become almost worthless through cultivation could best be utilized for permanent pasture. Wild grasses and leguminous plants will afford good grazing in summer and fall.

A slate phase of the Conasauga shale loam lies directly west of Fairmount and Ranger. The soil is derived from bluish-green slate or greenish slaty shales which form a hilly belt 1 to 3 miles wide, entirely across the county from north to south. The soil from the slates contains larger and thicker rock fragments, the depth of weathering is less, the soil layer thinner, and the topography somewhat rougher than in the shale loam areas to the westward. Small fragments of white cellular quartz, derived from veinlets in the slate, are fairly abundant in places. The land is thoroughly cut up by innumerable hollows, leaving very narrow drainage divides. Only a small percentage of the slate land has been cleared for farms, and much of it is too broken and steep to be of any value for cultivated crops. There is much land, however, on the gentler slopes and in the hollows which will return fair yields, when properly cultivated.

CONASAUGA SILT LOAM.

The Conasauga silt loam consists generally of a grayish-brown to pale-yellowish silt loam about 8 inches deep, with a yellow moderately compact silty clay loam which frequently passes below into yellow silty clay of a much less plastic structure than the subsoil of the Colbert silt loam. Shale fragments are encountered generally at 30 inches to 3 feet and the subsoil becomes somewhat more friable in structure at these depths. On many of the more nearly level areas having rather poor drainage, the surface material is a light-gray floury silt loam 3 or 4 inches deep, changing to a light-yellow silt loam which in turn grades into yellow silty clay loam or clay at about 8 inches. While the surface material is generally free from shale fragments, there are considerable areas, which have been more subject to erosion, where small shale chips are present but hardly in sufficient amounts to constitute a shale loam.

This soil is rather widely distributed throughout the shale belts, being generally closely associated with the shale loam and loam types of the series. It occupies the more nearly level areas, low-lying valley land, and the less eroded areas on the shale upland. The soil occurs in long, narrow strips conforming to the courses of creeks and branches, and in irregularly shaped areas on ridges, the outlines of the latter coinciding with the elevation contours around the heads of streams.

The rock giving the Conasauga silt loam is identical in character with that underlying the shale loam type, the differences in the soils being due to differences in topography and drainage. On the level stream divides the soil is purely residual, but on the valley slopes there is some material washed from the higher lying shale loam. Where this type lies in contact with soils of the Clarksville and Armuchee series, some admixture of soil materials has resulted.

The tree growth consists principally of shortleaf pine, post oak, hickory, white oak, Spanish oak, water oak, sweet gum, and black gum. The trees attain a somewhat larger individual growth than on the shale loam type, notably post oak and white oak, while water oak and shagbark hickory, which are present, are indicative of a higher moisture content.

The Conasauga silt loam is largely under cultivation, being utilized for cotton, corn, oats, and forage crops. The yields of cotton vary from one-fourth to one-half bale per acre, and corn 15 to 30 bushels. Commercial fertilizers are applied at the rate of about 200 pounds per acre for both corn and cotton. Sorghum gives good results, both when planted for sirup or when sown for forage.

The soil is easily tilled ordinarily, and while a few acres might be improved by ditching or tile drainage, the natural drainage is gener-

ally sufficient for the crops grown at present. The surface material shows a tendency to compact and harden, but this deficiency is due mainly to a lack of organic matter and can be corrected by turning under cowpeas or some other green crop. Deeper plowing than is generally practiced is suggested. Applications of lime or ground limestone usually improve crop yields on soils of this character.

The average results of mechanical analyses of samples of the soil and subsoil of this type are given in the following table:

Mechanical analyses of Conasauga silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
253025, 253095.....	Soil.....	1.0	1.3	0.9	2.2	6.2	67.9	20.3
253026, 253096.....	Subsoil.....	1.4	2.0	1.0	2.4	4.9	49.6	38.5

CONASAUGA LOAM.

The Conasauga loam is rather variable in character from the fact that it does not occupy the same topographic position in all parts of the county and from the fact that the material composing it has been derived from a diversity of sources. The differences in soils in different areas, however, are not considered sufficiently pronounced to warrant subdivisions.

The soil of this type over the greater part of the area consists of about 8 inches of brownish-gray or grayish-brown to pale-yellowish friable silty loam or loam underlain by a few inches of yellow silty clay loam, which quickly passes into moderately friable yellow clay. The surface material characteristically contains small, flat, or gravelly fragments of shale and other rock. In several places the fine material of the soil is a silt loam containing a high percentage of fine shale particles which impart a decidedly loamy structure, yet are not of sufficient size to produce a shale loam. The soil is thus intermediate between the silt loam and the shale loam types. In some of the loam areas adjacent to the Oostanaula, Coosawattee, and Conasauga Rivers, sand and fine gravel, residual from terrace deposits, which have been almost entirely removed by erosion, are mixed with silty shale soil to produce a loam. In several localities the subsoil has a reddish color in the lower part of the soil section and thus approaches the character of the Armuchee.

The Conasauga loam is closely associated with other types of the Conasauga and Armuchee series. It is widely distributed, but there are no large uniform bodies in any one part of the county. Its total area is slightly less than that of the silt loam type.

This soil occupies gently undulating land and appears on the lower slopes of shale loam hills. The topography is less hilly than that of the shale loam type and is more undulating and better drained than the silt loam.

The land is well drained and is easily tilled. The surface soil is generally loose and friable and the subsoil generally friable, but in places showing a tendency to become very hard and compact during periods of dry weather. The soil is deeper than that of the shale loam type and is less liable to destructive erosion. It has about the same or perhaps a slightly higher agricultural rank than the silt loam. Cotton is the principal crop; small amounts of corn, oats, sorghum, and cowpeas are also grown.

Conasauga loam, light phase.—A light-textured phase of the Conasauga loam occurs in association with the Montevallo shale loam in the western part of the county. It is confined to a narrow ridge extending from the Whitfield County line north of Resaca southwestwardly into Floyd County near Plainville. The soil differs from the Conasauga loam as described chiefly in its higher content of fine sand. It is a grayish-brown to light-yellow friable loam 8 to 10 inches in thickness underlain by yellow friable silty clay loam which changes to moderately friable yellow clay. Disintegrated or partially decomposed rock is generally encountered at about 3 feet. The surface material nearly everywhere contains a considerable percentage of angular, gravelly fragments of siliceous shale or sandstone. This phase occupies valley slopes and low ridges. The parent rock is a grayish finely arenaceous shale and sandstone which weathers to a yellow or brownish color. The rock probably belongs mainly to the Rome formation, although some of the siliceous shale may be a part of the Conasauga formation.

The soil might, on the basis of color and other characteristics, be classed with the Dekalb series, except that the Dekalb is elsewhere characterized by a more mountainous topography.

Most of the land has been cleared and placed in farms. Yields of one-fourth to one-half bale of cotton per acre are obtained, while the yields of corn and oats are about the average for the county, 12 to 20 bushels per acre. A more extensive growing of cowpeas and other legumes would profitably improve the land. Many of the hillsides are subject to gullying and destructive erosion and soon deteriorate unless very carefully cultivated.

The following table gives the average results of mechanical analyses of samples of the typical soil and subsoil and single analyses of samples of the soil and subsoil of the light phase of this type:

Mechanical analyses of Conasauga loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
Typical:		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
253061, 2530117,	Soil.....	4.6	5.8	3.1	6.9	11.9	49.6	18.2
2530145.								
253062, 2530118,	Subsoil....	2.6	2.8	1.5	2.9	5.8	46.4	38.0
2530146.								
Light phase:								
253035.....	Soil.....	3.9	2.1	1.7	6.7	37.4	31.9	16.6
253036.....	Subsoil....	2.1	1.9	1.2	5.5	29.8	29.7	29.4

RESIDUAL MATERIAL—SANDSTONE AND SHALE.

DEKALB SERIES.

The surface soils of the Dekalb series are gray to brown, while the subsoils are commonly some shade of yellow. The soils are derived from the disintegration of sandstones and shales from Cambrian to Carboniferous in age. Only one type, the stony silt loam, of this series was mapped in the present survey. It is derived from the less ferruginous beds of the Rockwood formation. On account of the roughness of the topography it is of little agricultural value.

DEKALB STONY SILT LOAM.

The Dekalb stony silt loam is a mountainous type of very little agricultural value in this county. The soil consists of 10 to 12 inches of grayish or grayish-brown silt loam underlain by yellow moderately friable silty clay loam. Large blocks or flags of hard sandstone are scattered over the surface and disseminated through the soil section.

The type occupies a narrow belt on the slopes of Horn Mountain. A small inconspicuous area was mapped near John Creek Mill in The Pocket.

The soil is derived from gray and purplish arenaceous shale and thin-bedded gray and greenish sandstone belonging to the Rockwood formation.

The land is rough, stony, and difficultly accessible so that it has but little value for farming purposes at the present time. There are, however, small tracts which can be easily rendered arable and the greater part of the area will doubtless be utilized in the future as the farming population increases and farming land becomes more valuable. Orchard and small fruits would probably succeed.

WATER-LAID MATERIAL (OLD ALLUVIUM)—MIXED DERIVATION.

TYLER SERIES.

The surface soils of the Tyler series are gray to grayish brown. The subsoils are yellowish to mottled yellow and gray and of rather compact and slightly plastic structure. The series is usually developed on second terraces of streams in that part of the Appalachian region where sandstone and shale soils largely predominate over limestone soils. The drainage is not good, and structural conditions are rather unfavorable. The type is best suited for grazing and hay production.

TYLER SILT LOAM.

The Tyler silt loam is a light-gray to grayish-brown silt loam underlain at about 6 to 8 inches by mottled gray and yellow silty clay loam, which passes below into plastic silty clay mottled with yellowish and grayish colors. In places the silty loam surface covering is not more than 3 or 4 inches thick. A small strip of this type near Oostanaula has a fine or very fine sandy loam surface soil, but is not considered of sufficient agricultural importance to be shown on the soil map as a separate type.

The Tyler silt loam occupies poorly drained areas on the "bench land" or low terrace, 5 to 15 feet above the first bottoms, along the Oostanaula and Coosawattee Rivers. The largest tract lies on the east side of the Coosawattee, near Thompson Ferry. These silt loam areas possibly represent the sites of old sloughs or flood-plain lakes. The land is at present above the level of ordinary floods, but is occasionally overflowed.

The soil material has been derived from the terrace alluvium, which represents material washed mainly from the crystalline rocks of the Appalachian Mountain province, but with a considerable admixture of detritus from shales and limestones of the Appalachian Valley. The soil has assumed a different appearance from the Wickham and Holston on account of poor drainage conditions.

The tree growth consists of shortleaf pine, white oak, water oak, hickory, maple, sweet gum, and black gum.

Only a small percentage of the land is under cultivation. Where the land has been ditched fair yields of corn have been obtained. The soil is probably best adapted for grasses. Redtop would doubtless succeed. Lespedeza or Japan clover grows wild. Sorghum will give fair results. The land is not suited for cotton.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of the Tyler silt loam:

Mechanical analyses of Tyler silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
2530109, 2530151	Soil	0.1	0.4	0.6	8.9	16.9	55.2	17.6
2530110, 2530152	Subsoil.....	.2	.6	.7	11.5	17.3	40.7	28.9

WATER-LAID MATERIAL (RECENT ALLUVIUM)—MIXED DERIVATION.**HOLLY SERIES.**

The Holly series is characterized by the gray color of the surface soils and the mottled gray and yellow or brown color of the subsoil. These soils are developed in the first bottoms and are subject to frequent overflow. The drainage is poor, and in their present condition they are best suited to grasses. They are derived from alluvial or mixed colluvial and alluvial material.

HOLLY SILT LOAM.

The surface material of the Holly silt loam consists of a gray or grayish-yellow silt loam 8 to 12 inches deep, while the subsoil consists of a gray or mottled grayish and yellowish silty clay loam, passing at about 20 to 30 inches into a compact or moderately plastic gray or gray and yellow mottled silty clay. Rusty brown mottling and black oxidation material are noticeable in places.

The soil is colluvial or colluvio-alluvial in origin, occurring in the shallow drainage depressions along the upper courses and at the heads of streams which flow from areas of Clarksville soils. In places chert gravel has been washed from areas of Clarksville gravelly loam and is scattered over the surface or forms a layer in the subsoil or substratum. Where the material has been largely washed from the Shackleton fine sandy loam and Christian fine sandy loam, the soil is sandy, but is not considered of sufficient extent or agricultural importance to be shown separately on the soil map.

The land is flat and generally poorly drained. Some of it is cultivated, fair yields of corn being obtained. The soil, however, is naturally best adapted to forage crops. Sorghum and cowpeas will do well; Herds grass (redtop) has been sown with a fair degree of success in one locality. Lespedeza grows wild.

BROWN SOILS.**RESIDUAL MATERIAL—LIMESTONE.****HAGERSTOWN SERIES.**

The Hagerstown series in this county is characterized by brown surface soils and yellowish-brown to dull-red clay subsoils. They are residual from limestone belonging chiefly to the Conasauga forma-

tion. The small area of Hagerstown in The Pocket is underlain by the Chickamauga formation, and the small areas near Sugar Valley are underlain in part by limestone from the Fort Payne chert formation. They are excellent general farming soils.

HAGERSTOWN SILT LOAM.

The Hagerstown silt loam consists typically of light-brown to rich dark brown mellow silt loam or heavy silty loam about 8 to 12 inches deep, underlain by a few inches of yellowish-brown silty clay loam which grades below into yellowish-red or dull brownish red moderately compact and stiff clay. A few small areas of loam have been included in the silt loam type, since there is little agricultural difference in the two.

There are no large uniform areas in Gordon County quite typical of the Hagerstown series. The soils grade on the one hand into the Decatur clay loam and loam types and on the other into Colbert silty clay loam. In the less thoroughly drained areas the subsoil is more of a yellow color than is typical of the Hagerstown; small black and brownish iron oxide accretions are also present.

The total area is small, covering about 9.8 square miles. The principal areas are found in Oothkalooga Valley south of Calhoun and a number of small tracts lie in the narrow limestone valleys in the vicinity of Fairmount, Ranger, and Oakman.

The Hagerstown silt loam is a valley soil, occupying level to gently undulating land which lies generally at a slightly lower elevation than adjacent Decatur clay loam. On the whole, drainage is fairly well established, although there are a few tracts which could be improved by tile drainage.

The soil is residual from hard bluish-black or bluish-gray argillaceous limestone. The thickness of the mantle of residual decay or depth to the rock floor is generally 5 to 10 feet. The lighter color in comparison with the deep red of the Decatur is ascribed to the slight difference in topographic position, the less thorough drainage being unfavorable for extreme oxidation of iron-bearing minerals.

Small areas of woodland which remain indicate that the land was originally covered with a sturdy growth of red oak, white oak, post oak, black oak, shagbark hickory, water oak, and sweet gum, together with elm, walnut, ash, cedar, and haw. The difference in the varieties and character of the growth of the trees on the Hagerstown and other limestone soils in comparison with the shale soils is notable and significant of differences in the character of the soils.

The Hagerstown silt loam is a good general farming soil adapted in this section of the country to cotton, corn, small grain, and grasses. The soil possesses a fair humus supply in its virgin state which can be

easily maintained where careful methods of cultivation are followed. Deep plowing and occasional subsoiling are advisable to prevent the immediate subsoil from becoming unduly hard and compact. Applications of burnt lime or ground limestone would probably be beneficial.

HAGERSTOWN GRAVELLY LOAM.

The surface soil of the Hagerstown gravelly loam is a dark-brown friable loam having a thickness of about 8 to 15 inches; the immediate subsoil is a dull reddish brown friable clay loam which grades into a reddish-brown or dull-red gritty clay. The subsoil is more friable than that of the Hagerstown silt loam. Angular fragments of chert and sandstone, generally not more than 3 or 4 inches in their greatest dimensions, are present in the surface soil, but not in sufficient amount to interfere seriously with cultivation.

This type is of small areal extent. The principal occurrences lie to the northwest of Sugar Valley. Here, the soil occupies low elevations, 10 to 20 feet above the small creek valleys, and only a few feet above adjacent Murrill gravelly loam areas. It is generally lower than the Decatur clay loam in this part of the county and less thoroughly drained.

The underlying rock is limestone, with perhaps a small amount of interbedded chert, which probably belongs to the Fort Payne chert formation, although it is not entirely certain that some of the rock does not belong to the Floyd formation. The gravel is not entirely residual from the weathering of the underlying rock, but is in part foreign material, especially the sandstone, which has been carried from the mountain slopes to the west and northward.

The Hagerstown gravelly loam northwest of Sugar Valley is a productive soil, returning ordinary yields of one-half to 1 bale of cotton and 25 to 30 bushels of corn per acre. Cowpeas attain a rank growth.

A narrow belt of limestone soil appearing on each side of the The Pocket Valley in the extreme northwestern part of the county is included on the soil map with this type, although the soil is not exactly similar to that northwest of Sugar Valley. This soil is underlain by the Chickamauga limestone formation and the subsoil is perhaps largely residual from the weathering of this calcareous formation, but in the surface soil there is a considerable admixture of creep material from the Rockwood formation on the slopes of the mountains and from the cherty ridge of Knox dolomite, which occupies the central part of the valley. The soil is a grayish-brown to brown loam or silty loam about 10 inches in thickness, underlain by a reddish-brown moderately friable clay loam. The soil is not quite as gravelly as that northwest of Sugar Valley. It has a somewhat lower productivity.

RESIDUAL MATERIAL—LIMESTONE AND SANDSTONE.

CHRISTIAN SERIES.

The soils of the Christian series are characterized by the brown to reddish-brown color of the surface portion and by the yellowish-red color of the subsoil. The material is derived largely from interbedded limestone and sandstone with some local influence from shale.

CHRISTIAN FINE SANDY LOAM.

The Christian fine sandy loam consists of a grayish-brown or brown loose, friable, fine sandy loam, underlain at about 5 to 12 inches by rather stiff, compact brownish-red to red fine sandy clay loam, which grades below into red, friable, fine sandy clay. The lower portion of the subsoil and the substratum are usually rather stiff and compact, but the material is consistently more friable than the corresponding portion of the Decatur soils. This lower material is often mottled some with ocherous yellow.

The grayish-brown fine sandy loam surface soil is deepest on the more nearly level, less eroded tracts, while on small eroded knolls and on the steeper slopes there is in many places a covering of only 3 or 4 inches of fine sandy loam, the heavy, red clay loam being turned up in plowing. A few sandstone and chert fragments are scattered over the surface but nowhere in sufficient amounts to constitute a gravelly loam.

This type is closely associated with the Shackleton fine sandy loam and has much the same character of topography, occurring in undulating to gently rolling country. Small isolated hills or knolls occur throughout the Shackleton fine sandy loam areas. The largest single tract lies in the vicinity of Farmville.

The Christian fine sandy loam is a residual soil derived from the weathering of interbedded magnesian limestone or dolomite and sandstone.

The red color in contrast to the gray and yellow of the associated Shackleton fine sandy loam may be due generally to a topographic position favorable to more complete oxidation. In several places there is a suggestion that the underlying rock was originally more ferruginous in the Christian areas. In these places fragments of iron ore, mixed with the sandstone and chert, may be observed.

This soil has about the same agricultural value as the Shackleton fine sandy loam, perhaps naturally a little stronger and more durable, but seems to be a little more subject to erosion and gullying. Cotton, corn, oats, and cowpeas are the principal crops. The land is generally well drained. The heavy, stiff clay loam which lies near the surface in many localities renders the soil rather intractable or difficult to plow.

Average results of mechanical analyses of samples of the soil and subsoil are given below:

Mechanical analyses of Christian fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
253023, 2530121....	Soil.....	0.9	3.9	10.7	35.3	16.5	24.9	7.4
253024, 2530122....	Subsoil.....	.6	2.2	6.8	21.7	12.2	30.1	26.4

RESIDUAL MATERIAL—SHALE, SANDSTONE, AND LIMESTONE.

ARMUCHEE SERIES.

The Armuchee series is similar in origin, topography, and soil structure to the Conasauga series, differing in color, having brownish to red soils and red subsoils. In Gordon County the soils are derived principally from shales of the Conasauga formation similar to those beneath the Conasauga series, but containing interbedded argillaceous limestone, which decomposes into red clay. A small area of the silt loam type is derived from shales of the Floyd formation.

ARMUCHEE SHALE LOAM.

The Armuchee shale loam consists of a friable grayish-brown silty loam to silt loam, underlain at about 5 to 8 inches by red silty clay loam or silty clay of a brittle structure. Both the soil and subsoil contain a large quantity of small shale fragments, which impart a porous, open structure. The underlying beds of shale are encountered generally at about 24 inches to 3 feet, and on the tops of hills and on eroded slopes the rock lies even nearer to the surface. As mapped, the subsoil is often yellowish red in color. In many old cultivated fields and on the steeper slopes the brownish silty loam surface soil has been removed by erosion, leaving a reddish shaly silty clay loam or clay loam, and in such cases the soil does not differ materially from the Armuchee clay loam, except in the larger quantity of shale fragments. Eastward from Sugar Valley and in the vicinity of Hill City the underlying shale is more thickly laminated, more siliceous, and generally decomposes into a somewhat heavier clay than that at other localities. The soil in this part of the county is typically a grayish-brown to brown friable silty loam for about 8 inches, thence a reddish-yellow to buff clay, which passes into a rather compact and stiff dull-red clay, which, however, is rendered friable by small rock fragments. The shale fragments are angular, block-like, and really more in the nature of gravel than the flattish fragments typical of shale disintegration.

The type is widely distributed throughout the shale belts of the central part of the county, occurring in close association with the soils of the Conasauga series. The red and yellow shale soils are so intimately associated in some localities that it is impossible to make satisfactory separations on the soil map, and consequently small bodies of Armuchee shale loam will be found distributed through the Conasauga shale loam areas. The principal areas of the Armuchee shale loam are located east of Hill City, in the vicinity of Sonoraville, and between Fairmount and Oakman. The type occurs in low, hilly areas on low ridges and on rounded knobs, which in many places rise rather conspicuously above adjacent limestone valleys.

The Armuchee shale loam is residual from shales of the Conasauga formation, calcareous or closely interbedded with thin limestone layers. The reddish color of the soil in contrast to the yellow of the associated Conasauga series is believed to be due to the influence of the calcareous strata, which decompose into red clay, rather than to any difference in the argillaceous shales. The two series have a similar topography.

The Armuchee shale loam hills are thickly wooded with shortleaf pine, Spanish oak, hickory, post oak, blackjack, and other hardwoods, the species being apparently the same and having much the same character of growth as on the Conasauga shale loam hills.

The land is well drained and, except on the steepest hillsides, is easily cultivated. The soil, however, is especially subject to blanket erosion and gulying, and unless carefully cultivated soon deteriorates.

The principal crops grown are cotton, corn, and oats, cotton probably being most profitable. Peaches will do well where the bedrock does not lie too near the surface. The agricultural value is about the same as that of the Conasauga shale loam, although there is probably a slightly greater proportion of the Armuchee under cultivation. Commercial fertilizers are commonly used on all crops. Good grazing can be secured, even from the rougher portion.

ARMUCHEE CLAY LOAM.

The Armuchee clay loam consists of a reddish-brown silty clay loam, underlain at about 4 to 8 inches by red moderately friable clay. In places the subsoil varies to yellowish red. There are included spots which have a thin surface layer of grayish-brown silt loam overlying reddish silty clay loam, which passes quickly into red clay. Brownish and reddish fragments of shale are distributed throughout the soil section, and the underlying partially disintegrated and decomposed parent rock is commonly encountered at 3 to 5 feet. The fine shale particles produce a somewhat friable and loamy structure, but, notwithstanding, the surface material tends to clod especially on

the more eroded slopes. On the smoother land the virgin soil consists of a thin surface layer of grayish-brown silt loam or silty loam underlain at 3 to 5 inches by red or reddish-brown silty clay loam, which passes into red clay.

The Armuchee clay loam occurs in small irregularly shaped separate bodies throughout the central valley division of the county, generally closely associated with Decatur and Hagerstown soils. The largest areas are located near Sonoraville and Fairmount. It generally occurs on the lower or middle slopes of ridges and hills, but also occupies level to gently undulating areas in valleys.

The soil is residual from the same geological formation and much the same character of rocks as the shale loam type. There is, however, a greater amount of calcareous strata or limestone interbedded with the argillaceous shale. In places the soil is derived entirely from a bluish-black highly argillaceous limestone. The product of decomposition of this rock is a deep-red clay containing brown flattish earthy fragments resembling shale, so that where the underlying rock is not exposed one might be easily deceived as to its character. The red color and heavy texture of the soil are believed to be due mainly to the calcareous character of the parent rock, together with a topographic position favorable to good oxidation. In a few places this type does not differ materially from the Decatur clay loam, except in the presence of a considerable amount of shaly rock fragments. The soil is mainly residual, but by virtue of its rather general position on hill slopes some creep material from higher lying soils is present. At the base of the Appalachian Mountains escarpment near Fairmount and Ranger it contains creep material from the schists and slates which give rise to the Talladega soils.

Most of this type is cultivated, and there are no large forested areas remaining. The species of trees seem to be about the same as on the Armuchee and Conasauga shale loam hills, but individual trees have a sturdier growth. Clumps of cedar are common where underlying calcareous rocks lie near the surface.

The soil is deeper and is generally regarded as being more fertile and durable than that of shale hills. Precaution should be taken to prevent serious erosion on the slopes. Yields of one-half bale of cotton are commonly obtained on the better cultivated farms. Some wheat is still grown on this type, but much less than formerly. Clover can be grown and a greater acreage of this legume would probably prove profitable in that it furnishes excellent hay and at the same time is a means of maintaining the fertility of the soil.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Armuchee clay loam:

Mechanical analyses of Armuchee clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
253005.....	Soil.....	5.0	4.4	2.1	5.4	4.0	47.6	31.6
253006.....	Subsoil.....	5.3	6.1	2.5	4.5	3.6	37.2	40.8

ARMUCHEE SILT LOAM.

The soil of the Armuchee silt loam type is a grayish, grayish-brown or pale-yellowish silt loam to silty loam about 6 to 8 inches deep, while the subsoil is a yellowish to reddish silty clay loam, which grades below into yellowish-red to red rather stiff clay. The subsoil in some places has reddish and yellowish mottlings. Small particles of shale are present in the surface soil, and the parent shale rock is encountered at about 3 feet, the subsoil generally becoming more friable from disintegrated rock particles at about 30 inches.

This type occupies smooth areas on ridges and gentle valley slopes throughout the Armuchee shale loam and Conasauga and Colbert silt loam areas. The type is relatively of little agricultural importance in this county, and only a few small widely separated areas were mapped. There are, however, numerous very small areas, in various situations associated with the Armuchee shale loam and Colbert silt loam types, which have been unmapped because of their insignificant size. The soil is residual from shales belonging to the Conasauga and Floyd formations.

This type probably has about the same agricultural value as the Conasauga silt loam and Colbert silt loam and is adapted to the same crops.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Armuchee silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
2530137, 2530161....	Soil.....	2.0	2.0	1.2	2.8	21.1	56.4	14.6
2530138, 2530162....	Subsoil.....	1.4	3.5	1.9	3.4	12.2	38.9	38.6

RESIDUAL MATERIAL—SANDSTONE AND SHALE.

HANCEVILLE SERIES.

The Hanceville series is characterized by grayish to reddish surface soils and a bright-red and brick-red clay loam to clay subsoil. In Gordon County these soils occupy the crests and slopes of Horn, John, and Mill Creek Mountains. They are derived principally from ferruginous sandstones and shales of the Rockwood formation. The gravelly loam type, however, along the eastern slopes of Horn Mountain, is residual principally from shales of the Floyd formation, and is associated with beds or pockets of limonitic iron ore. The red color of the soil is attributed to the ferruginous character of the parent rock, together with a topographic situation favorable for complete oxidation. The stony loam type is of low agricultural value.

HANCEVILLE STONY LOAM.

The Hanceville stony loam typically consists of a brownish to reddish loam to silt loam, underlain at about 3 to 10 inches by dull-red to red friable clay loam, which quickly grades into brick-red or hematite-red, rather friable to moderately stiff or brittle clay. In places local mould accumulation has given the surface few inches a dark-brown to nearly black color and mellow structure. The surface is strewn with small fragments and large scattered blocks of sandstone, which are also present, but to a less extent, in the subsoil.

This type occupies considerable areas on the crests and steep upper slopes of Horn and John Mountains in the northwestern part of the county.

The soil is principally residual but from the nature of the topography some material of colluvial origin is to be expected. The parent rock is a thick-bedded sandstone and interbedded thin-layered fine-grained grayish and purplish sandstone and varicolored arenaceous shales belonging to the Rockwood formation. At the southern end of Horn Mountain soil has been included in this type which is largely residual from the decay of Devonian chert and shale. The soil here is strewn with large fragments of porous chert and sandstone; it is a dark-brown to almost black friable loam, underlain at 12 to 18 inches by red, gritty clay.

Most of the Hanceville stony loam type is too rough or too inaccessible to be of much value for agriculture at the present time. There are, however, small areas which could be placed in a cultivable condition and much of the land might be used for small fruit or berry farms. The land is forested with shortleaf forest pine, red oak, blackjack, hickory, and scattered chestnut and chestnut oak.

HANCEVILLE GRAVELLY LOAM.

The Hanceville gravelly loam typically consists of 6 to 12 inches of grayish-brown or yellowish silty loam, or loam underlain by moderately stiff, brittle, dull-red or brick-red clay. The surface is covered with angular chert and sandstone fragments, which vary considerably in size and quantity. These fragments are too small to be classed as stones, averaging more nearly the size of gravel. The subsoil below 12 or 15 inches is generally free from coarse rock fragments. There are a few small areas included in this type where the surface soil is comparatively free from gravel, and a loam or clay loam in texture.

This type occupies undulating slopes and low ridges and hills on the lower slopes of Horn, John, and Mill Creek Mountains. In a few places the land is too rough and gravelly for cultivated crops, but much the larger percentage of the area is arable.

The Hanceville gravelly loam consists of a gravelly surface layer, which is largely colluvial in origin, much of the soil material having been washed from the higher mountain slopes which are occupied by the Hanceville and Clarksville stony loams and the Dekalb stony silt loam, while the subsoil is residual principally from fine-grained shales of the Floyd formation. The type is rather closely associated with pockets or beds of limonitic iron ores which lie on the lower slopes of Horn Mountain. The narrow belt of this type which lies in "The Pocket" is derived from ferruginous sandstone and varicolored shales of the Rockwood formation. Some of the areas southwest of Oostanaula and near Hill City are underlain in part by the Fort Payne formation, and in these localities the subsoil is more friable than where the shale is the underlying rock.

The tree growth consists principally of shortleaf pine, post oak, hickory, and a smaller amount of red, black, and Spanish oak, sweet gum, and black gum.

The soil is well drained, but is not subject to serious erosion, except on a few very steep slopes. The agricultural value of the land varies according to the size and amount of the rock fragments; some of the land is so thickly strewn with rock fragments from 2 to 6 or 8 inches in length that plowing and cultivation of crops are extremely laborious. Probably 50 per cent of the area is under cultivation. The smoother and less gravelly land will return one-half to three-fourths bale of cotton per acre and 15 to 25 bushels of corn. Small amounts of wheat and oats are also grown. Peaches do well and apples also would probably succeed.

RESIDUAL MATERIAL—METAMORPHIC ROCKS.

TALLADEGA SERIES.

In this county the Talladega series has brown to red soils with red clay subsoils. This series is characterized by a high percentage of very fine mica in the subsoil which imparts a peculiar smooth or greasy feel to the moist clay. The soils are residual and have been derived from mica schists and semicrystalline slates. This series lies in the Appalachian Mountains province.

TALLADEGA SLATE LOAM.

The Talladega slate loam consists generally of a very thin surface covering of friable grayish-brown silty loam, beneath which there is a dull brownish red silty clay loam which quickly grades into red brittle clay. The surface material is full of small flattish fragments of schist or slate which impart an open loamy structure. The clay subsoil has a characteristic greasy feel, especially in the lower part, due to the presence of minute flakes of micaceous mineral and other partially decomposed red material. The subsoil contains considerable small rock fragments and generally soft partially decomposed rock is reached at about 3 feet. On many cultivated slopes the soil is reddish and of a clay loam or silty clay loam texture, the brownish surface silty layer having been removed by erosion. The type includes some patches of Talladega clay loam, stony loam, and loam too small to map.

This type occupies the greater part of the mountainous section of the eastern part of the county. The surface is rough, being minutely dissected by streams. The slate loam appears both on steep slopes and on the crests of the narrow ridges or stream divides.

The underlying rock is a grayish or greenish sericitic schist, quartz schist, and bluish-gray, very hard semicrystalline slate or gray-wacke. In a few places the schists are cut by thin veins of quartz, and flat fragments of this rock are scattered abundantly over the surface.

The tree growth on the ridges consists principally of post oak, red oak, Spanish oak, blackjack, shortleaf pine, and a few chestnut, chestnut oak, and upland black gum, while tulip, poplar, maple, elm, and some walnut are found on the lower slopes near the creeks and branches.

Only a small percentage of the total area is under cultivation and the region is sparsely settled. The land is difficult to till on account of the stones and rough topography, and the fields are liable to become gullied unless terracing or other preventive measures are taken. Yields of one-third to one-half bale of cotton and about 15 to 20

bushels of corn are obtained from the more carefully cultivated fields. Some of the land might be utilized for small fruit or berry farms and favorably situated slopes for apple orchards.

TALLADEGA CLAY LOAM.

The Talladega clay loam is closely associated with the Talladega slate loam type, occupying the more nearly level portions of ridges and the more gentle slopes. This soil typically consists of reddish clay loam to silty clay loam, underlain at about 3 to 8 inches by red clay which at about 3 feet grades into reddish to brownish soft partially decomposed rock. The clay subsoil has characteristically a smooth greasy feel, especially in the lower portion of the 3-foot section. In many places there is a thin mantle of grayish or yellowish-brown silt loam or silty loam overlying the reddish clayey material. There are also included patches of clay on eroded slopes. Small rock fragments are scattered over the surface, but are hardly in sufficient amount or of such size to constitute a gravelly loam or interfere with cultivation. A small amount, however, of what is properly slate loam or stony loam, has been unavoidably included in the clay loam areas.

The principal upland areas of this type occur in the less mountainous section east and northeast of Fairmount. A narrow belt lies at the base of the mountain escarpment a short distance east of Ranger, between Fairmount and Colima. In this location the soil does not differ in appearance greatly from the adjacent Armuchee soils, being distinguished from them chiefly by the small black or grayish schist particles in the surface soil and the characteristic greasy feel of the subsoil. The total area is considerably less than that of the slate loam type.

The Talladega clay loam is residual in origin, with a few colluvial accumulations on slopes, being derived from greenish-gray to black micaceous schists and semicrystalline gray slate. In the vicinity of Rye and southeast of Fairmount the rock is a bluish-gray, very hard, coarsely laminated graywacke slate. It is decomposed and friable to depths of 10 to 20 feet and in weathered exposures resembles a decomposed igneous rock. In the first stage of decomposition the rock changes to a grayish-brown, further to a dull-brown, and finally completely decomposes into an intense light-red or red clay.

The forest growth is predominantly shortleaf pine, post oak, hickory, and Spanish oak; tulip, elm, poplar, hackberry, sycamore, and some walnut appear on moist slopes adjacent to streams.

A large portion of this type has been placed under cultivation and has returned fair yields of cotton and corn with very small or no applications of commercial fertilizers. The soil is more productive

than the slate loam type. Yields of one-half bale of cotton and 20 to 30 bushels of corn are obtained on the better farms. Small amounts of wheat, rye, and oats are grown, although but little attention is given to the cultivation of these grains and the yields are low. Red clover will succeed on this soil and farmers will find it profitable to devote a greater acreage to this legume. Apples and other fruits which are at present grown only in some small orchards seem to do well.

The soil is subject to destructive washing or gullying and preventive measures should be taken when the land is first cleared. Winter cover crops of rye or oats after corn and cotton are advised. This type is durable, where protected from erosion, and is capable of being improved and made highly productive with a small amount of labor and expense.

Average results of mechanical analyses of samples of the soil and subsoil are given below:

Mechanical analyses of Talladega clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
253039, 253089.....	Soil.....	3.5	3.5	1.5	4.2	14.2	49.6	23.0
253040, 253090.....	Subsoil.....	1.6	1.9	1.1	3.9	9.6	37.6	43.9

RANGER SERIES.

The soils of the Ranger series are similar in structure and topography to the Talladega soils, but are characterized by a brown to black surface soil and brown to reddish-yellow or dull-red clay loam to clay subsoil. The darker color of the soil is due mainly to the content of dark-colored rock material present. The slate loam is the only type of this series mapped in the county. It is derived from metamorphic rocks of the Appalachian Mountain division of the county, including graphitic or carbonaceous schists and slates.

RANGER SLATE LOAM.

The typical Ranger slate loam consists of a dark-brown silty loam or silt loam carrying enough dark-colored schist material to impart a dark cast and greasy feel, underlain at about 6 to 12 inches by brownish-yellow or yellowish-brown silt loam or silty clay loam, which in turn passes at about 15 to 30 inches into reddish-yellow to brownish-yellow friable silty clay loam to silty clay. The subsoil also has a greasy feel owing to the presence of partially decomposed micaceous material. The immediate surface inch or so is often black or slaty

gray on account of the presence of schist material or both schist material and organic matter. On the lower slopes the depth of the soil is commonly deeper. There are included patches of black to slaty-gray silt loam underlain by slate-colored or bluish schist. This mass of partially decomposed schist may be reached anywhere within the 3-foot section; it is usually encountered within 10 or 15 inches of surface. Small flattish fragments of the parent schist and micaceous schist are plentiful on the surface and to a less extent through the soil section, except on lower slopes where colluvial material has accumulated. As the parent rock becomes lighter in color the derivation material approaches more closely the characteristics of the Talladega. This type is locally styled "black slate land."

This type occurs in a narrow belt on the crest of the Appalachian Mountains escarpment east of Fairmount and Ranger; northeast of Ranger the belt widens to about 2 miles and extends into Pickens and Gilmer Counties.

The soil varies in character with its topographic position accordingly as it occurs on the crests of the narrow ridges, on steep slopes or on low gentle slopes at the bases of mountains. A colluvial phase in coves near the Pickens County line is composed in places of a rich black loam to a depth of a foot or more, with a black or brown silty clay loam subsoil. Colluvial accumulations reach a thickness of 8 or 10 feet in some places. On steep mountain slopes, the soil is thinner and the rock fragments are larger in size, the soil in many places having a stony rather than a slaty or gravelly character. On the crests of the narrow ridges the soil is generally more of a brownish to slate-gray or black color, while the subsoil is more of a yellowish-brown to reddish-yellow color. Also flattish rock fragments are more plentiful in the soil portion, and soft slaty schist, but little disintegrated, lies nearer the surface, usually within 15 or 20 inches of the surface.

Small areas of Talladega soil are included in the Ranger slate loam area as mapped. The Talladega is distinguished from the Ranger in having a more reddish color in the subsoil and by the absence of dark graphitic material. It was found impracticable to map the included red soils separately with accuracy on account of the rough mountainous topography and inaccessibility of the country.

The soil has been derived from the weathering of black graphite or carbonaceous semicrystalline slates and schists and dark-gray quartz schist. The rocks belong to the old Ocoee series, which on the basis of recent stratigraphic studies is regarded as Lower Cambrian in age.¹

The slates disintegrate generally into small flat fragments; the quartz schist appears in larger blocks. The dark color of the soil is

¹ Index to the Stratigraphy of North America, Professional Paper, 71, page 89, U. S. Geological Survey.

attributed to minute particles of black rock as much as to humus or decomposed vegetable matter.

The land is forested and at present is valued chiefly for its timber. The tree growth on the ridges consists of red oak, post oak, Spanish oak, hickory, shortleaf pine, blackjack, and a small amount of chestnut and chestnut oak. In the coves and on the low moist slopes there is a heavy growth of poplar, tulip, white oak, elm, beech, hard maple, gum, walnut, and white pine.

Only a very small area is in farms. Fair yields of cotton and corn have been obtained and the soil is considered equal or superior in productiveness to the Talladega clay loam and slate loam. Most of the land, however, is too rough or too inaccessible to be of much agricultural value at present. Selected tracts could possibly be utilized for orchards; apples would probably do well. There are small areas in coves which could easily be placed in a cultivatable condition and utilized for some special crop, such as tobacco, which will give a large money return per acre.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of the Ranger slate loam:

Mechanical analyses of Ranger slate loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
253087, 2530101....	Soil.....	9.3	7.8	2.7	4.0	8.2	53.4	14.6
253088, 2530102....	Subsoil.....	7.6	7.1	2.6	4.4	6.7	46.9	24.6

COLLUVIAL-RESIDUAL MATERIAL - SEDIMENTARY ROCKS.

MURRILL SERIES.

The soils of the Murrill series are brown, with yellowish-brown to reddish subsoils. They occupy undulating to gently sloping areas near the foot of mountains and ridges and are derived from sandstone, shale, and limestone material. The surface soils consist principally of colluvial material from the adjoining slopes and are derived chiefly from sandstone and shale, though some limestone enters into this colluvial wash. The subsoil in the Gordon County area usually consists of residual material from shale, modified somewhat by limestone in certain areas.

MURRILL GRAVELLY LOAM.

The Murrill gravelly loam generally consists of 8 to 12 inches of grayish-brown to brown friable silty loam or loam underlain by yellow to yellowish-brown or brownish-yellow silty clay. The surface material is characteristically gravelly and loose in structure, while

the lower subsoil is generally free from gravel and compact in structure. Small areas in drainage depressions have a light-gray surface soil and a light-yellow subsoil, the gravel in the lower part of the 3-foot section being in places loosely cemented.

The gravel of this type consists of angular or subangular fragments of sandstone and chert, varying in size from fine gravel to blocks 5 or 6 inches in their greatest dimension, with scattered stones of larger size near the base of the mountains. Sandstone slightly predominates over chert. The subsoil has somewhat the character of both that of the Conasauga and Colbert silt loams.

The Murrill gravelly loam occurs on a gravel-covered, gently sloping plain which extends 2 to 3 miles eastward from the base of Horn Mountain, the eastern limit of the gravelly soil being marked approximately by the line of the Southern Railway between Oostaula and Hill City. A second area occupies the more nearly level land in the Rocky Creek Valley lying between Horn and John Mountains. The land occupied by this type is gently undulating with flat or level areas adjacent to streams. This soil is closely associated with the Hanceville gravelly loam, but occupies lower lying areas.

The Murrill gravelly loam consists of a gravelly surface layer, largely colluvial material, with a subsoil or substratum residual from shales. The gravel covering varies considerably in thickness and in the size and amount of the fragments. Along the eastern edge of the belt where the soil merges with the Colbert silt loam and other types the gravel covering is very thin, but increases in thickness toward the base of the mountains, the separate fragments also showing an average increase in size. At the mouths of mountain coves and along many of the small streams the gravel covering attains a thickness of 2 or 3 feet. Such material really constitutes a separate phase of the Murrill gravelly loam. The areas of such colluvial wash, however, are small, of no especial agricultural importance, and have consequently been included in the soil map with the Murrill.

The gravel is almost entirely sandstone and chert and can readily be traced to its source, the Rockwood and Fort Payne formations, which occupy the slopes of the mountains. Limestone fragments are not found in the soil, although probably a small amount of the fine soil material has been washed from soil derived from limestone layers in the Fort Payne or Floyd formations. The underlying shales belong mainly to the Floyd formation, while a somewhat smaller percentage of the area is underlain by the Conasauga formation. The strata of both formations in this locality consist of argillaceous shales, thinly laminated and of olive-green or drab color, weathering brown or yellow, and decomposing into rather compact clay. In places very thin layers of limestone are closely interbedded with the

shale. It is regarded as improbable that any considerable part of the surface gravel is derived from the underlying rock.

The tree growth consists principally of shortleaf pine, white oak, post oak, hickory, red oak, sweet gum, black gum, and tulip. Considerable beech, birch, poplar, and hard maple appear along the drainage ways along the eastern edge of Horn Mountain.

The productivity of the soil varies with the thickness of the surface gravelly layer and the size and amount of coarse rock fragments. Near the base of the mountains the gravel is in places of such size and in such abundance that tillage is difficult. The land on the whole has fair drainage, but a few of the lower lying areas are poorly drained and the soil is rather cold notwithstanding its gravelly nature. The better drained and less gravelly parts of the type are but little inferior in productivity to the near-by Hagerstown gravelly loam and Decatur clay loam. It is estimated that about 50 per cent of the area is under cultivation. Cotton, corn, and oats are the chief crops. There is a considerable acreage devoted to sorghum and cowpeas and small amounts of wheat and rye are grown. The yield of cotton on the better farms is one-half to 1 bale per acre, while 25 to 30 bushels of corn are produced. Commercial fertilizer is applied at the rate of about 200 pounds per acre, a 10-2-2 grade being the most common in use. Sorghum, either for sirup or for forage, gives good results.

In the improvement of the land it is advisable to turn under cowpeas or some other green crop in order to maintain a good supply of organic matter. Better drainage in a few areas can be effected by ditching. Where the compact clay subsoil lies near the surface deeper plowing than is at present practiced will tend to improve the physical condition of the soil.

Average results of mechanical analyses of samples of the soil and subsoil of the Murrill gravelly loam are given below:

Mechanical analyses of Murrill gravelly loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
253071, 253077.....	Soil.....	2.4	4.9	3.4	4.4	17.8	53.1	14.2
253072, 253078.....	Subsoil.....	1.3	2.9	1.8	2.8	13.6	51.6	26.0

WATER-LAID MATERIAL (OLD ALLUVIUM)—MIXED DERIVATION.

HOLSTON SERIES.

The Holston series consists of yellowish-brown to brown surface soils and yellow subsoils. It is developed in the eastern part of the United States on old alluvial terraces, in some places standing 200

feet or more above the first bottoms of streams. The soils consist principally of material washed from sandstone and shale soils, and on this account are somewhat less productive than the Elk soils, which they closely resemble but which contain more limestone material. The Holston soils are generally underlain by sandstone or shale, and in places the lower subsoil seems to be partly residual from these rocks.

HOLSTON FINE SANDY LOAM.

The Holston fine sandy loam is a light grayish brown, loose fine sandy loam which quickly passes into pale-yellow heavy fine sandy loam, and this in turn at about 6 to 10 inches into yellow friable fine sandy clay to sticky clay. In the lower part of the 3-foot section the material frequently assumes a reddish cast or mottled reddish and yellowish color. There is generally a red substratum. The surface soil nearly everywhere contains a considerable amount of rounded or water-worn gravel and some cobbles, which in a few places are in such quantity as to interfere with cultivation. The more gravelly areas are indicated on the soil map by symbols—small circles. The gravel vary from bird's egg size to cobbles 3 to 6 inches in diameter, while a few scattered subangular boulders, 10 to 18 inches in length, are found.

This type is confined in its distribution to a high terrace plain lying adjacent to the Oostanaula, Coosawattee, and Conasauga Rivers.

The terrace deposits lie 50 to 75 feet above the river flood plains and extend back one-half to 1 mile from either side of the streams. The terrace was probably originally much wider and more extensive, since the water-worn gravel are found as far as $2\frac{1}{2}$ miles from the present location of the rivers. It was doubtless a continuous level plain, but has been so dissected and denuded by erosion that few level tracts of any considerable extent have been preserved. The fine sandy loam type is mostly found capping high hills; in many places there is only a scanty gravelly covering of 10 or 12 inches over a subsoil residual from shales or limestone.

This soil, together with the associated silt loam type and the high terrace phase of the Wickham loam, is derived from fluvial deposits of probable early Pleistocene or Pliocene age. The deposits have a thickness of 5 to 15 feet, but may have been originally somewhat thicker. The deposits consist largely of detritus washed from the metamorphic and igneous rocks of the Appalachian Mountain province directly to the eastward. There is present probably some material from soils derived from shales. The cobbles are predominantly quartzite and vein quartz, while scattered large subangular fragments of schist and gneiss are found. In a few places a very small amount of chert is mixed with the foreign material. It is assumed that the fluvial

deposits were originally red or were oxidized red subsequent to their elevation. The grayish and yellow color of the Holston fine sandy loam then is believed to be due to leaching and removal in suspension by rain waters of iron oxide and fine clay and silt particles. This change has not extended deeper than 3 feet, since a red substratum appears at about this depth.

Practically all of this type has been placed under cultivation. The soil has a loose structure, is easily tilled, excepting a few extremely gravelly areas, and well drained. Cotton and corn are the chief crops. The soil is probably naturally better adapted to cotton than to corn. Yields of one-third to one-half bale of cotton and about 15 to 20 bushels of corn are obtained with applications of about 200 pounds of 10-2-2 fertilizer. The soil will respond readily to fertilizers and warms up fairly early. Its texture and structure are favorable for melons, peanuts, sweet potatoes, and other truck. A liberal use of stable manure or green manure is necessary to make the soil highly productive. On some of the hills the land is liable to destructive washing.

HOLSTON SILT LOAM.

The Holston silt loam is a terrace soil associated with the Holston fine sandy loam. This soil typically consists of a friable gray to grayish-brown silt loam which at a depth of about 8 to 12 inches grades into a yellow fine sandy clay loam, this in turn passing into a yellow or yellow and red mottled moderately stiff gritty silty clay loam to silty clay. There is generally a red substratum. The soil is gravelly in a few places, but on the whole less so than the fine sandy loam type. A low-terrace phase of this type occurs at a few localities along the Oostanaula River, in association with the Wickham loam. This phase occupies a position 10 to 15 feet above the first bottom, whereas the high terrace lies 50 to 75 feet above. The color and structure of the soil are not materially different from the higher phase.

This type is confined nearly altogether to level terraces along the three rivers of the county. There are no large extensive tracts, but rather a number of widely separated plateaulike areas, with intervening residual soils where the original terrace deposits have been removed by erosion.

The silt loam soil material has been derived from the same source as that of the fine sandy loam type. The higher silt content in comparison may be due to the generally flat or level surface and consequently less thorough drainage and slower movement of the rain water which runs off the surface.

The agricultural value of the Holston silt loam is possibly a little higher than that of the fine sandy loam. It is perhaps better adapted

to corn. The low-terrace phase gives about the same yields of cotton as the higher land, namely, one-half bale per acre, while the average corn yields are slightly larger. Cotton will mature a little earlier on the higher land. Sorghum and cowpeas give fair results. A greater acreage devoted to cowpeas or other leguminous crops will be found ultimately profitable.

WICKHAM SERIES.

The surface soils of the Wickham are reddish or reddish brown and overlie reddish, more or less micaceous subsoils. The soils occupy river terraces, generally have a level or gently undulating surface, and are fairly well drained. The materials forming these terraces, which in Gordon County lie from 15 to 50 feet above the streams, have been washed from crystalline rocks.

WICKHAM LOAM.

The Wickham loam is a brown to brownish-red or reddish-brown mellow loam to silty loam, underlain at about 6 to 10 inches by a dull brownish red to red moderately compact silty clay loam, which grades downward into a red friable clay. In places the upper subsoil consists of a yellowish silty clay loam. This soil is free from gravel, except for a few scattered cobbles, generally of large size. The soil does not possess as high a content of micaceous minerals as the adjacent Toxaway and Huntington types. Small areas of brown and yellow soils having the character of the Holston series are found in the less thoroughly drained spots.

This type is of small areal extent. It occupies a low level terrace or "bench land" along the Oostanaula and Coosawattee Rivers, which lies 5 to 15 feet above the Huntington and Toxaway first-bottom land and 25 to 35 feet above river level. This low terrace is not continuous, but has been cut through by streams tributary to the rivers and has been almost entirely removed by stream erosion, only widely separated remnants existing at present.

The soil has the same origin as the Holston soils, being derived from alluvial or fluvial deposits. The mineral part of the soil material has been largely derived from the crystalline rocks of the mountainous region to the east of this area.

The land is entirely under cultivation. The ordinary crop yields are about one-half bale of cotton, 25 to 30 bushels of corn and 30 to 40 bushels of oats. The soil is deep, durable, and naturally fertile. Deeper plowing, with the turning under of cowpeas or some other leguminous crop, and a crop rotation will result in greatly increased yields. Cotton matures a little earlier than on the Huntington and Toxaway soils, but the small-boll early maturing varieties will probably give the best results.

Wickham loam, high-terrace phase.—The high-terrace phase of the Wickham loam is associated with the Holston fine sandy loam and lies 60 to 75 feet above the river levels.

The soil is a brown to reddish-brown mellow loam or silty loam, changing at about 4 to 8 inches into a dull-red moderately friable silty clay loam, this passing into deeper red moderately friable clay. In places the upper subsoil has a yellowish color. The subsoil contains a high percentage of red iron oxide and is a deeper red than that of the low terrace. Waterworn gravel of quartzite and quartz, with in places a small amount of chert, varying in size from a hen's egg to cobbles 5 or 6 inches in diameter, are generally scattered over the surface and in places are in sufficient amount to constitute a gravelly loam.

This phase occupies the more eroded and washed parts of the high river terraces. There are only a few level tracts of considerable area.

The soil is derived from old alluvium of the same age as that which underlies the Holston series. The deposit reaches a thickness of 10 to 15 feet. The basal layer along the Coosawattee River is a jumbled mass of quartzite cobbles and angular fragments of schist and gneiss, together with a few fragments of shale and other rock of local origin. The red finer material becomes rather hard in gully exposures, probably from the formation of an iron oxide cement.

This phase, where not seriously eroded or washed, returns about the same yields of cotton and corn as the typical soil. Cotton matures a little earlier.

The following table gives the average results of mechanical analyses of samples of the typical soil and subsoil of the Wickham loam:

Mechanical analyses of Wickham loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
253033, 253053, 2530105, 2530123.	Soil.....	1.2	3.0	3.5	17.1	18.9	38.9	17.0
253034, 253056, 2530106, 2530124.	Subsoil..	.6	1.7	2.0	10.8	14.7	36.6	33.4

WATER-LAID MATERIAL (RECENT ALLUVIUM)—MIXED DERIVATION.

TOXAWAY SERIES.

The soils of the Toxaway series have brown to very dark brown surface material and brown subsoils. The mica content is high. The soil material has been derived almost entirely from the decay of metamorphic rocks, crystalline schists, slates, and gneisses of the Appalachian Mountains physiographic province.

TOXAWAY FINE SANDY LOAM.

The Toxaway fine sandy loam is a type of small areal extent, occurring in association with the Toxaway silt loam along the Coosawattee River. In addition a narrow strip lies along Talking Rock Creek in the extreme northeastern part of the county. The soil consists of 12 to 15 inches of brown, very loose, friable fine sandy loam underlain by a lighter brown friable fine sandy loam. The soil is micaceous, but does not possess quite the greasy feel of the silt loam type, probably on account of the lower clay content. There is little or no difference in the texture of the surface material and that of the subsoil. The content of organic matter is fair, but less than that of the silt loam type.

This soil occupies first-bottom land along the streams and is subject to overflow. The land, however, is fairly well drained and the soil is easily tilled on account of its loose structure. Corn and cotton are grown, but the yields are on the average lower than on the silt loam type. Such crops as watermelons, peanuts, and sweet potatoes would probably give good results.

TOXAWAY SILT LOAM.

The surface material of the Toxaway silt loam consists typically of a brown to very dark brown or nearly black friable silt loam underlain at about 15 inches by brown or yellowish-brown, friable, compact silty clay loam. This soil characteristically contains a high percentage of micaceous minerals, which impart a somewhat fluffy feel and a loose, loamy structure; the moist soil when rubbed between the fingers has a greasy character. The principal observable difference between this type and the Huntington silt loam is in its higher content of micaceous mineral and the darker color both in the soil and subsoil. Along the small streams the alluvium shows wide variation in texture, ranging from friable light loam to rather heavy silty clay loam. In the lower, poorer drained situations the subsoil is yellowish or mottled yellowish and grayish in color and rather plastic in structure, but such areas are not representative of the type.

The principal area of this type lies along the Coosawattee River from the Murray County line to a point about $1\frac{1}{2}$ miles below Thompson Ferry. The land along the river lies 15 to 18 feet above normal water level, but is subject to occasional flooding. Narrow strips of the soil occur along all of the streams which traverse or issue from the mountainous belt of schistose rock in the eastern part of the county. The flood plains of the small streams are subject to frequent overflow.

The soil is alluvial material from the Appalachian Mountains derived from the decay of semicrystalline slate, schists, and gneisses,

which in this county give rise to the Talladega soils and the Ranger slate loam.

The Toxaway silt loam along the Coosawattee River is one of the most fertile and productive soils of the county. The soil is deep, easily tilled, and naturally rich in humus. Yields of 40 to 60 bushels of corn are obtained during favorable years and three-fourths to 1 bale of cotton. Oats give correspondingly good yields. Cotton is likely to be late in maturing, therefore small-boll, early maturing varieties will give the best results. Clover can be grown, and this crop could probably be made very profitable. If the land is kept in good physical condition there is little need for commercial fertilizers. Phosphoric acid might be advantageous in hastening crops to maturity.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Toxaway silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
253045, 253091.....	Soil.....	0.6	1.4	1.4	11.6	19.6	46.8	18.0
253046, 253092.....	Subsoil.....	.3	1.8	2.1	10.5	15.3	45.3	23.9

HUNTINGTON SERIES.

The Huntington soils are light brown to brown, and the subsoils yellow to light brown. Frequently there is little change in the color or the character of the material from the surface downward. The soils are developed in the first bottoms of streams, where they are subject to overflow. They consist generally in the areas where they have been mapped of material derived from limestone, sandstone, and shale soils, but in the Gordon County area there is evidently some admixture of material derived from igneous and metamorphic rocks. They represent generally well drained soils of the first bottoms of the county.

HUNTINGTON SILT LOAM.

In Gordon County the Huntington silt loam is the most widely distributed alluvial soil. As developed along the rivers this soil consists of 12 to 15 inches of brown silt loam or silty loam underlain by brown, moderately compact silt loam to silty clay loam. The soil generally contains a considerable amount of fine mica. It is chiefly free from gravel both in the surface soil and subsoil. As mapped the soil is not entirely uniform in texture, small areas showing variations toward a fine sandy loam and toward a heavy loam.

On the level less thoroughly drained land the subsoil is yellow rather than brown in color.

The principal occurrence of this type is on the bottom lands along the Oostanaula, Coosawattee, and Conasauga Rivers. The land is nearly level, although generally fairly well drained, and lies 15 to 25 feet above the normal water level of the streams. It is subject to partial overflow nearly every year, and there are occasional complete inundations.

The alluvial material is washed from soils derived in part from shales, limestone, and sandstone of the Appalachian Valley and in part from igneous and metamorphic rocks of the Appalachian Mountains. In the river valleys there is a mixture of the materials from the two sources. Along the Coosawattee River, advancing upstream, the Huntington merges into the Toxaway silt loam, and a line of division between the soils of the two series is arbitrarily drawn. The flood plain alluvium has a fairly uniform thickness of 15 to 20 feet.

The Huntington soils along the rivers are regarded as among the most fertile soils in the county, and practically all of the bottom land is under cultivation. The original forest probably consisted principally of oaks, sycamore, ash, shagbark hickory, maple, and poplar. These are the trees found in the strips of timber which have been allowed to remain along the river banks.

Little difficulty is experienced in tillage operations unless the land is plowed either very wet or very dry. In such cases hard clods form, and rolling is necessary to effect a good seed bed.

Corn, cotton, oats, and cowpeas are the principal crops; small patches of sorghum, wheat, rye, and different hay grasses are also grown. The soil is probably naturally best adapted to corn. Yields of 30 to 40 bushels are obtained under present methods of cultivation without any or with but small applications of commercial fertilizers. Most farmers plant cowpeas in the corn at the time of the last cultivation and turn under the vines in the fall. Yields of one-half to 1 bale of cotton are commonly obtained with applications of about 200 pounds of commercial fertilizer, generally a 10-2-2 grade. Small-boll early maturing varieties give the best results. Oats—some rust-proof variety is generally planted—return good yields. A few farmers still plant small patches of wheat, but hardly more than 12 or 15 bushels per acre are obtained. Hay grasses, such as redtop, will do well. Clover can also be grown.

Much larger average yields can be obtained by giving more attention to seed selection, by deeper plowing, and by occasional applications of burnt lime or ground limestone. If a system of crop rotation is practiced and larger amounts of legumes grown, there is little need for commercial fertilizers on a soil of this character.

The narrow strips of this type which occur along the small streams of the county are generally more poorly drained and more subject to frequent overflow than the land along the rivers and generally somewhat lower in productiveness.

HUNTINGTON SILTY CLAY LOAM.

The Huntington silty clay loam as typically developed along Sallacoa Creek consists of a light-brown to dark-brown moderately friable silty clay loam 12 to 15 inches in thickness, underlain by a brown, rather compact silty clay loam to about 20 to 24 inches, thence a brownish-yellow to light-brown moderately plastic silty clay loam to silty clay. This type, however, shows rather wide variations along different streams due to difference in drainage conditions and source of the soil material. Where the soil material has been washed from soils derived almost entirely from shales, as along Dry Creek and Lick Creek, the surface soil is grayish brown and the subsoil yellow. Where the alluvium has been derived in part from wash from Armuchee clay loam and Decatur clay loam the surface soil is of a rather chocolate or reddish-brown color, as in a few places along Oothkalooga Creek. There are also minor variations in texture principally toward a silt loam.

This type lies along the smaller streams, only a few small areas being found in the flood plains of the rivers. The largest areas occur along Sallacoa and Pine Log Creeks. The soil along these streams occupies level plains lying 6 to 10 feet above the streams, and varying from one-fourth to 1 mile in width. Along many of the smaller creeks the bottom land is not more than 3 to 5 feet above the stream channels. All of the land is subject to much more frequent overflows than the bottom land along the rivers and as a result crops are more likely to be damaged.

The alluvium of this type is of local origin, having been derived principally from shale and limestone soils. Along Sallacoa Creek, however, a considerable amount of the detrital material has been carried down from the schistose rocks which underlie areas of Talladega and Ranger soils.

The tree growth in the low, poorly drained land consists of water oak, white oak, sycamore, elm, ash, shagbark hickory, hard maple, poplar, and a few swamp white oaks.

On account of poor drainage and liability to frequent overflow, a large part of the land along the smaller creeks has never been placed under cultivation. The Sallacoa and Pine Log Creek bottoms, however, are nearly all under cultivation, being utilized principally for corn, to which crop the soil seems to be best adapted. The yields are generally about 30 bushels per acre, but as much as 60 bushels per acre is obtained on some farms during favorable years. Sorghum and

hay grasses, such as redtop, will also do well, and can be grown along the smaller creeks where the soil is too poorly drained for other crops. Only a very small amount of cotton is grown on this type.

This soil shows a greater tendency to clod and crust than the silt loam and fine sandy loam types and tillage is a little more difficult.

HUNTINGTON GRAVELLY LOAM.

The Huntington gravelly loam is of small extent and of less agricultural importance in this county than the other soils of the Huntington series. The soil consists of brown to grayish-brown friable loam, ranging to sandy loam in places, and containing generally sufficient gravel to constitute a gravelly loam. The gravel consists of sandstone and chert both in rounded and subangular fragments, which increase in size and angularity toward the heads of the streams, until the alluvium merges into coarse colluvial wash. From about 12 or 15 inches to 3 feet the alluvial material consists of yellowish-brown, gritty, silty clay loam or friable loam. A layer of gravel and sand is encountered in most places at about 3 feet. This type is subject to frequent overflow. The principal occurrences are in the narrow flood plains of Snake Creek and Rocky Creek, in the northwestern part of the county, the soil material having been carried down from the mountainous areas drained by these streams.

The land is utilized principally for corn, yields of 25 or 30 bushels being obtained during favorable years. The soil conditions are favorable for the growth of sorghum and hay grasses.

HUNTINGTON FINE SANDY LOAM.

The Huntington fine sandy loam as it is developed along the Oostanaula River consists generally of 12 to 15 inches of dark-brown fine sandy loam underlain by lighter brown to yellowish-brown fine sandy loam. There is very little difference in the texture of the soil throughout the 3-foot section and but little difference in color, except that the surface material is a somewhat darker shade from organic matter. As is generally true of alluvial soils, the type is not entirely uniform in texture, the soil is generally sandier on the banks of the river, while a short distance back toward the river bluffs the surface soil is heavier and the material in the lower part of the 3-foot section is in many places a heavy loam. The soil generally contains a considerable percentage of fine mica. It is free from gravel.

This type is confined principally to the level bottom lands along Oostanaula River. The soil material in a large measure represents detritus from shale, sandstone, and limestone soils of the Appalachian Valley, although the river has its source in the mountainous region to the eastward and the alluvium consists in part of sediment derived

from the crystalline schists and igneous rocks. The bottoms lie 15 to 20 feet above normal river level, but are subject to occasional overflow. Complete inundation generally occurs during the winter months, and therefore crops are rarely lost from this cause.

The Huntington fine sandy loam is all under cultivation, being utilized principally for corn, cotton, and cowpeas. Corn yields are 25 to 40 bushels per acre without any or with but small applications of commercial fertilizer. The land will return one-half to three-fourths bale of cotton per acre, although this crop is likely to be late in maturing. Melons and peanuts do well. The soil is easily tilled, and deep plowing can be practiced. If the content of humus is maintained, there is little need for mineral commercial fertilizers except possibly phosphorus.

The narrow strips of fine sandy loam which are found along some of the small streams have generally a lighter color, a grayish-brown surface soil, and a yellowish subsoil, are subject to more frequent overflows, and have a lower agricultural rank than the Huntington fine sandy loam along the rivers.

RED SOILS.

RESIDUAL MATERIAL—LIMESTONE.

DECATUR SERIES.

The Decatur series in this county comprises brownish to red surface soils and deep, intense red clay subsoils. The soils are residual from limestone belonging chiefly to the Conasauga formation. A few small areas of Decatur soil near Sugar Valley are underlain in part by limestone from the Fort Payne chert formation. These soils constitute some of the most productive and durable types of the county.

DECATUR CLAY LOAM.

The Decatur clay loam consists of 8 to 12 inches of dark-red to dark reddish brown mellow clay loam, underlain by deep-red or blood-red moderately plastic clay. The soil naturally contains a good supply of humus. The subsoil shows a tendency to become very hard and compact during periods of drought. In small areas on the more nearly level tracts there is in places a thin brown loam surface layer of 3 or 4 inches overlying the heavier red clay loam.

This type is confined principally to the limestone valleys, in which it occupies nearly level areas and low, rounded hills or slight elevations a few feet above the adjacent Hagerstown and Colbert soils. The largest tracts lie in the Oothkalooga Valley southward from Calhoun; in the valleys south of Sonoraville, and in the Fairmount-Ranger Valley in the eastern part of the county. There are also several areas of considerable size in the vicinity of Sugar Valley. There are no large extensive areas in any one part of the county,

but rather a number of small separate occurrences. The total area is 12.3 square miles.

The Decatur clay loam of the Oothkalooga Valley, and in the southern and eastern parts of the county, is a residual soil, derived from the decay of bluish-black both pure and highly argillaceous limestones of the Conasauga formation. The red clay residue of decomposition is generally 5 to 15 feet in thickness and it is only on eroded slopes that rock outcrops are seen. Decomposition of the rock is complete, except for small flattish earthy fragments resembling shale, which are residual from the more argillaceous phases of the limestone. A small amount of sandstone gravel is scattered over the surface in the vicinity of Sugar Valley, but the rock is foreign, being most probably residual from ancient deposits of wash carried down from the mountain slopes. The Decatur in this locality is probably derived from limestone beds of the Fort Payne chert formation. There are a few small areas of this type on ridges in the Clarksville gravelly loam areas which are derived from the more ferruginous and less cherty limestones of the Knox dolomite formation.

The deep-red color of the Decatur soils in contrast to the brown and yellow of the closely associated Hagerstown silt loam and Colbert silty clay loam is ascribed to their higher topographic position and better drainage, which favor more complete oxidation. The limestone underlying the three soils has much the same lithologic character.

The Decatur clay loam is regarded as one of the most durable and productive general farming types of the county. It was one of the first soils to be cultivated and as early as 1850 is reported to have had a value of \$30 an acre in the Oothkalooga Valley. The soil is deep, well drained, and the structure and texture are favorable for the retention of moisture when proper methods of tillage are practiced. The soil, however, is rather heavy and large draft animals are required for deep plowing. Cotton and corn are at present the principal crops, but the soil is also adapted to small grains and hay. A small acreage is devoted to oats, cowpeas, sorghum, and wheat. The yields of cotton are one-half to 1 bale per acre, with about 200 pounds of commercial fertilizer, and the yields of corn are 25 to 40 bushels.

If deep plowing is practiced, and the soil kept in good physical condition and well supplied with organic matter, there is little need for commercial fertilizer. Occasional applications of burnt lime or ground limestone would probably prove beneficial. Clover can be grown profitably where the land is properly prepared for this legume. Alfalfa might also succeed on this type; in fact, it is being grown successfully at least in a small way on the same soil near Summer-ville, Ga.

DECATUR LOAM.

The Decatur loam typically consists of 8 to 10 inches of reddish-brown mellow loam underlain by a few inches of brownish-red clay loam, which quickly passes into dark-red compact clay. This soil is very similar to the Decatur clay loam type, differing from it chiefly in having a somewhat lighter textured and more mellow surface soil. It occupies the more nearly level tracts in the Decatur clay loam areas, both soils being residual from limestone of the same lithologic character. The textural and slight color differences possessed by the loam are due to its more level, plainlike topography, which does not permit quite as free drainage and oxidation. Erosion has not been sufficiently active to remove the loamy surface layer and thus bring the clay loam to the surface.

Only a few small areas of the loam type were mapped, the principal body lying about 2 miles east of Lilypond. However, small unmapped tracts, 2 or 3 acres in extent, are present in nearly all of the Decatur clay loam areas.

The Decatur loam has about the same agricultural rank as the clay loam. It is somewhat easier to till and easier to keep in good physical condition. The soil returns excellent yields of cotton, corn, and oats, and is adapted to clover, cowpeas, soy beans, and other hay and forage crops. Alfalfa would probably succeed.

DECATUR CHERTY LOAM.

The soil of the Decatur cherty loam consists generally of 3 or 4 inches of reddish-brown to grayish-brown friable loam to silt loam, underlain at shallow depths by red or yellowish-red clay loam which changes at about 10 to 12 inches to moderately stiff and compact red clay. Residual chert fragments are scattered over the surface and are also present in the subsoil, although the fragments are hardly in sufficient quantity to constitute a gravelly loam. The chert constitutes the principal field difference between this soil and the typical Decatur clay loam. In many places erosion has removed the loamy surface covering, bringing the red clay loam or clay to the surface.

This soil occupies considerable areas in association with the Clarksville gravelly loam, occurring both on the tops and steep slopes of hills or ridges. There is a suggestion that some of the soil is due to the erosion of original Clarksville gravelly loam, the gray and yellow surface material of that type having been largely removed on steep slopes, bringing the red clay subsoil or substratum so near the surface that it is turned up in plowing. There is an intergradation with the Clarksville, and a small amount of gravelly loam of that series has been included in the areas of the Decatur cherty loam as outlined

on the soil map. This soil, however, appears on the tops of ridges where there has been no great amount of erosion and is here residual from the more ferruginous limestone of the Knox dolomite. The red color in places is obviously due in part to the oxidation of limonitic iron ore which has been segregated in the residual clay, fragments of the iron ore being mixed with the chert gravel of the soil.

This soil has a somewhat lower agricultural rank than the typical clay loam. It seems to be more subject to gullying than the Clarksville gravelly loam, probably on account of the smaller amount of chert gravel.

Wherever the soil is protected from erosion, good yields of corn and cotton may be expected. Peaches do well, and a number of commercial orchards have been established, although the peach industry has not been profitable of late years and many of the orchards have been abandoned.

In the cultivation of a soil of this character it is essential to maintain a good supply of organic matter. The more seriously eroded and gullied fields of this and also of the associated Clarksville gravelly loam can be reclaimed by placing them in pasture. Bermuda grass, while in some respects objectionable, is best suited for checking erosion and eventually obliterating gullies.

RESIDUAL MATERIAL—SHALE AND SHALY SANDSTONE.

MONTEVALLO SERIES.

The surface soil of the Montevallo series is light brown or reddish. The subsoil material is usually purplish, red, and reddish brown or yellowish brown in color, and consists usually of partially disintegrated shale. The topography is prevailingly rolling, steep, narrow ridges being of common occurrence. The shale loam is the only member of this series mapped in Gordon County. It is confined to a narrow ridge, in the western part of the county, and is underlain principally by various colored arenaceous shales belonging to the Rome formation.

MONTEVALLO SHALE LOAM.

The Montevallo shale loam is typically a purplish-red or grayish-brown silty loam to very fine sandy loam averaging about 8 inches in thickness; the lower soil material is a dull purplish red silty clay loam, pervious and friable in structure. Small flattish and angular blocklike fragments of shale constitute a high percentage of both the soil and subsoil material. Frequently a bed consisting largely of partially weathered shale is encountered within the 3-foot section, while hard, undecomposed shale rock is encountered generally at 3 to 5 feet beneath the surface. This soil as mapped is rather variable.

Yellowish soils having the color characteristics of the Dekalb or Conasauga are so confused with the purplish soils that a separation of the smaller areas on the basis of color was not attempted. The soil in the swales or shallow drainage ways is notably lighter colored in the surface soil, more yellowish in the subsoil, and deeper than on the tops and upper slopes of the hills and ridges.

This type has a comparatively small areal distribution, being confined to a chain of smoothly rounded hills, which constitute a well-defined ridge, extending from the Whitfield County line about 3 miles north of Resaca, southwestwardly into Floyd County, near Plainville. This ridge is approximately one-fourth to 1 mile wide and has an elevation of 50 to 100 feet above the low land on either side.

The Montevallo shale loam is residual from purplish-red, finely arenaceous shale interbedded with gray and yellowish highly arenaceous shale and shaly sandstone. The purplish shale is minutely jointed, hard, and breaks with a hackly fracture, so that in places the loam has a gravelly rather than a shaly character. The underlying strata belong in the main to the Rome formation, although it is not improbable that some of the underlying shale represents a siliceous phase of the Conasauga formation.

Most of the land of this type has been cleared and placed under cultivation. The uncleared hills are covered with a thick growth of shortleaf pine, together with a smaller amount of oaks and hickory. Individual trees do not attain a large growth.

New land returns yields of cotton and corn slightly higher than those of the Conasauga or Armuchee shale loams. The soil, however, seems to be especially subject to erosion and gullyng and as a consequence many abandoned fields are to be found. It is extremely difficult to prevent erosion of a soil having the peculiar loose structure which this type possesses; terracing is not very effective. The steeper hill slopes can be most profitably utilized for hay crops or permanent pasture. Gullied land can be reclaimed by sowing to Bermuda grass.

BLACK SOILS.

RESIDUAL MATERIAL—LIMESTONE.

HOLLYWOOD SERIES.

The soils of the Hollywood series are characterized by their dark-gray to black color, heavy texture, and refractory structure. The subsoils consist of dark-gray to yellow, sticky, heavy clay, occasionally mottled with red. The soils are of limestone origin and occupy low, flat limestone valleys, being frequently found near streams. The prevailing refractory structure of the soil makes cultivation difficult except under favorable conditions of moisture.

HOLLYWOOD CLAY.

The Hollywood clay is a limestone soil similar in topographic position and origin to the Colbert silty clay loam, differing from that soil chiefly in the darker color of the surface material. The soil consists of about 8 inches of very dark grayish brown to black plastic clay, underlain by brownish-yellow, plastic, impervious clay, which below a depth of about 30 inches in places becomes yellow and mottled with gray. Faint ochereous-yellow mottlings are common in the subsoil. The underlying rock appears at depths of 2 to 4 feet with a sharp plane of separation between the rock floor and the residual clay.

There are only four or five small bodies of this type and it is of comparatively little agricultural importance. A small area occurs in the limestone valley about 2 miles southwest of Fairmount and other small areas were found a short distance west of Ranger and Oakman. It occupies level or flat tracts along small branches or drainage ways.

The soil is residual from bluish-black hard limestone apparently similar to that underlying adjacent Hagerstown, Decatur, and Colbert soils. Tillage is difficult on account of the heavy, sticky, and plastic character of the surface soil. Corn and cotton are grown but with small success. The corn plants very often "goober," or "french," these being local terms to express a tendency of the leaves to turn yellowish and become sickly. Cotton is inclined to "rust." For "frenching" of corn and "rusting" of cotton applications of potash salts have been found beneficial on other soils of a sticky nature, such as the Iredell. Where drainage can be effected the soil will probably be very productive and durable. Without drainage it is best adapted for grass and forage crops. Sorghum will do well, and millet will also probably succeed.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of the Hollywood clay:

Mechanical analyses of Hollywood clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
253057, 253097.....	Soil.....	1.9	2.9	2.1	4.6	5.4	46.3	36.7
253058, 253098.....	Subsoil.....	2.7	3.0	1.5	3.6	4.5	36.7	48.0

MISCELLANEOUS MATERIAL.

ROUGH STONY LAND.

Rough stony land is a classification which includes land so steep and stony in character that it is unfit for agricultural use. The principal area of such land is located on the slopes of John and

Horn Mountains in the northwestern part of the county, while a few small areas in the mountainous section of the eastern part of the county were also mapped. The rough mountainous land is covered with a heavy forest growth of shortleaf pine, oaks, hickory, scattered chestnut, and other hardwoods, and is valued chiefly for its timber, being of little or no value for grazing. The Rough stony land of the northwestern part of the county embraces the roughest portions of the Hanceville and Clarksville stony loam and Dekalb stony silt loam areas, while that in the eastern part includes creek bluffs and precipitous ravine slopes in areas of the Talladega and Ranger slate loams.

SUMMARY.

Gordon County is located in the northwestern part of Georgia and comprises an area of about 372 square miles, or 238,080 acres. It lies principally within the Appalachian Valley physiographic province, with a narrow belt 3 to 5 miles in width in the extreme eastern part of the county included in the Appalachian Mountains province. The topography is undulating to hilly and mountainous; the part included within the Appalachian Valley consists of a succession of north-east-southwest ridges and valleys. The central portion of the county has a general elevation of 700 to 900 feet above sea level; the mountainous areas reach a maximum elevation of about 1,700 feet above sea level. Streams are numerous and most of them are perennial; abundant supplies of healthful water are easily obtainable.

The climate is mild; the summers are long, but are seldom excessively hot; the winters are never extremely cold. There is a growing season of about 6½ months.

Cotton is the principal agricultural product and the staple money crop. It is grown on practically all of the soil types. Corn and oats follow cotton in acreage and value of the crops. Small amounts of wheat, rye, cowpea hay, sorghum hay, and sirup are produced. The soil and climate are favorable for fruit. Peaches have been grown extensively, a good quality of fruit and good yields being obtained. The agricultural possibilities have hardly been realized, the soils and climate being favorable for a much greater variety of crops and greater yields than are at present produced.

The railroad facilities are good.

There is a diversity of soils, 39 types, exclusive of Rough stony land, having been encountered in the present survey. The soils are principally residual in origin. The loam and silt loam classes of soil predominate, while only small amounts of sandy and clay soils are present.

The Conasauga and Armuchee series are derived from shales. The first includes the soils having yellow subsoils, the second those having

red subsoils. The soils occur in gently rolling valleys and on low hills. The shale loam type predominates. The Colbert soils are also principally derived from shales, but a greater amount of calcareous shale and interbedded limestone is present than in the rock under the Conasauga soils and the subsoils are heavier.

The Clarksville soils occur on ridges and are for the most part gray in color and gravelly. They occupy a large area and are suitable for general farming and for fruit.

The limestone valley soils are included principally in the Hagerstown and Decatur series. These soils are naturally productive, strong, and durable and excellent for general farming.

The soils of the mountainous section of the eastern part of the county are included in the Talladega and Ranger series. The soils are fertile, but only a small percentage of the total area has been placed under cultivation on account of the roughness of the topography and the inaccessibility of the region.

The soils of the mountains of the western and northwestern parts of the county are embraced mainly in the Hanceville and Dekalb series. The land is rough, stony, and of low agricultural value. The Hanceville and Murrill gravelly loams occupying the lower undulating slopes of the mountains are arable types of value for general farming and fruit growing.

The Huntington and Toxaway types are the most valuable alluvial soils. These soils are well suited for corn and also return large yields of cotton.



[PUBLIC RESOLUTION—No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

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Conasauga silt loam	Clarksville silt loam	Hanceville stony loam	Talladega slate loam
Conasauga shale loam	Clarksville stony loam	Hanceville gravelly loam	Talladega clay loam
Conasauga loam	Shackleton fine sandy loam	Hollywood clay	Huntington fine sandy loam
Conasauga shale loam	Decatur cherry loam	Montevallo shale loam	Huntington gravelly loam
Colbert silt loam	Decatur clay loam	Wedham loam	Huntington silty clay loam
Colbert silty clay loam	Decatur loam	Holston shale loam	Huntington silt loam
Colbert shale loam	Christian fine sandy loam	Holston fine sandy loam	Ranger silt loam
Armuchee silt loam	Hagerstown silt loam	Holston silt loam	Holly silt loam
Armuchee shale loam	Hagerstown gravelly loam	Tyler silt loam	Toxaway silt loam
Armuchee clay loam	Murrill gravelly loam	Dekalb stony silt loam	Toxaway fine sandy loam
Clarksville gravelly loam			

LEGEND

Sil Silt loam
 Sicl Silty clay loam
 Sic Silty clay
 Dsh Decomposed shale
 L Loam
 C Clay
 Cl Clay loam
 Fsl Fine sandy loam
 Fsc Fine sandy clay
 Fsccl Fine sandy clay loam
 Dri Decomposed rock(schist)
 Sh Shale

Hugh H. Bennett, Inspector Southern Division
Soils surveyed by J. O. Veatch

Scale 1 inch = 1 mile

Field Operations
Bureau of Soils
1913

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